# The Automobile

Vol. XXXV
No. 12

NEW YORK, SEPTEMBER 21, 1916

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**Chicago, Ill., U. S. A.**

Stewart
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The AUTOMOBILE

VOL. XXXV NEW YORK—THURSDAY, SEPTEMBER 21, 1916—CHICAGO NO. 12

# 48,750 Studebakers in 8 Months

## 1710 More Than in Whole Year of 1915—Output Increasing

DETROIT, MICH., Sept. 16—The Studebaker Corp., for the first eight months of 1916, ending Aug. 31, has sold more cars than for the entire 1915 year. In number of cars, 48,750 Studebakers were sold from Jan. 1 to Aug. 31 of this year, as compared with 47,040 for the whole of last year, a gain of 1710.

At the present rate, 1916 sales will be 55.4 per cent greater than 1915, or about 73,125 cars, meaning an aggregate gain for 1916 over the previous year of 26,085 cars, if the present rate is maintained. As a matter of fact, however, it is practically certain that the balance in favor of 1916 over 1915 will be greater than the estimate just given, for the output is being steadily increased, and the factory reports sales for the last four months of this year in larger proportion than for the whole eight months of this year.

### 100,000 Cars Planned

It is believed that Studebaker will sell about 80,000 cars, and, with recently authorized factory extensions, including additional buildings and equipment, will enable the production of 100,000 cars, that being the mark set for 1917.

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### Monteith F. & H. Manager

COLUMBUS, OHIO, Sept. 16—John C. Monteith has been named general manager of the Phelps Mfg. Co., this city, maker of the F. & H. wire wheel.

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### Bill and Decou Resign from Nash Motors Co.

KENOSHA, WIS., Sept. 16—Louis H. Bill of the Nash Motors Co., formerly the Thos. B. Jeffery Co., this city, has resigned as general manager, effective Oct. 1. He expects to return to his home in San Francisco. Jerry Decou, who has been general factory manager, resigned Sept. 15 and is succeeded by John Bjorn, formerly superintendent. Mr. Bill's successor has not been announced. Bill is one of the old men in the trade having been branch manager of the H. A. Lozier Co. in the bicycle trade, becoming branch manager of the Jeffery company in 1905 and entering the factory in 1913.

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### Friend Returns to Mitchell as President

RACINE, WIS., Sept. 20—*Special Telegram*—Otis C. Friend has returned to the Mitchell Motor Co., Inc., as president and general manager, succeeding H. L. McLaren, who resigned 2 months ago. John W. Bate is vice-president and chief engineer.

Mr. Friend left the Mitchell company to become vice-president and general manager of the United Motors Corp., but assumes his new duties with the Mitchell company at once.

### Other Officers

W. H. Armstrong is secretary and treasurer and F. L. Mitchell, formerly treasurer, becomes comptroller. Mr. McLaren remains president of the Racine Tire Co.

Mr. Friend has been connected with the automobile industry for nearly a score of years beginning with the Chicago sales of the Locomobile. He joined the sales force of the Chicago Mitchell agency in 1900 and later handled Mitchells as the firm of Brown & Friend of Milwaukee. Mr. Friend then became purchasing agent of the Mitchell-Lewis factory and was successively assistant to J. W. Bate and general superintendent of shops. On Aug. 1 announcement was made that he had resigned as sales manager of the Mitchell-Lewis company to become vice-president of the United Motors Corp.

# Saxon Stock Placed on 7% Basis

## Fiscal Year Profits $1,316,272—Output 25,500 Cars, 15,651 Gain

NEW YORK CITY, Sept. 20—The dividend of the Saxon Motor Car Corp. has been increased from 6 to 7 per cent. This is put into effect by the declaration of a quarterly payment of 1¾ per cent, payable Oct. 2. Net profits for the year ending June 30 were reported as $1,316,272, or approximately $116,000 greater than the estimates made in official circles during the last quarter of the company's fiscal year, and equivalent to nearly $22 a share on the $6,000,000 stock. The first dividend was paid last July.

The output of the company during the fiscal year was 25,500 cars, an increase of 15,651 over the preceding year when 9843 cars were built.

President Harry W. Ford, in his annual statement to stockholders, reports that the company has on file contracts with dealers for 50,000 cars, with a number of territories still to be closed.

SAXON BALANCE SHEET—JUNE 30, 1916

| | | |
|---|---|---|
| **Assets** | | |
| Plant and equipment | | $73,914.18 |
| Investments | | 7,500.00 |
| Current Assets (Inc. Inventories) | | |
| Cash | $596,722.14 | |
| Notes and accounts receivable | 392,830.17 | |
| Inventories of materials and cars on hand | 2,134,326.94 | |
| | | 3,123,879.25 |
| Deferred charges | | 18,142.57 |
| Good will, models and pat. rights | | 4,557,229.08 |
| | | $7,780,665.08 |
| **Liabilities** | | |
| Capital stock | | $6,000,000.00 |
| Notes and accounts payable, etc. | | 907,222.38 |
| Surplus: | | |
| Being the profits earned for the eight months from Nov. 1st, 1915 | $963,442.70 | |
| Less: Dividend paid June 30, 1916 | 90,000.00 | |
| | | 873,442.70 |
| | | $7,780,665.08 |

# Hudson Coast-to-Coast Record

## Super-Six Covers 3476 Miles in 5 Days, 3 Hours and 31 Min.

TRANSCONTINENTAL RECORDS

| Car | Driver | Time Days | Hrs. | Min. | Date |
|---|---|---|---|---|---|
| Hudson | Paterson .. Mulford ... Vincent ... | 5 | 3 | 31 | Sept., 1916 |
| Marmon | Stevens ... | 5 | 18 | 30 | July, 1916 |
| Cadillac | Baker .... | 7 | 11 | 52 | May, 1916 |
| Stutz | Baker. .... | 11 | 7 | 15 | May, 1915 |

NEW YORK CITY, Sept. 19—The transcontinental record has been lowered 14 hr. 59 min. by a Hudson Super-six. The speed from San Francisco to New York averaged 27.14 m.p.h. and the distance was 3476 miles. The Hudson car reached New York 5 days, 3 hr. and 31 min. after leaving San Francisco. The best railroad time across the continent is 3 days, 21 hr. 45 min., according to railroad officials here.

### Left Wednesday, Sept. 13

The car left San Francisco with A. H. Patterson of Stockton, Cal., at the wheel at 12.01 a. m. Wednesday, Sept. 13. It arrived at Columbus Circle the following Monday at 6.31 a. m. Patterson drove to Elko, Nev., Mulford took the wheel there and drove to Laramie, Wyo. Patterson again took the wheel and brought the car to South Bend, Ind. C. H. Vincent drove the last lap of 910 miles into New York. With these men in the car were W. Sturm and L. Kalinsky.

### No Tire Trouble

The trip was made on United States Royal Cord tires and came through without trouble.

Following is the check of Hudson Transcontinental car:

Left San Francisco, Sept. 13, 12.01 a. m., checked by L. J. Pinkson, automobile editor San Francisco *Chronicle* and W. C. Kieffer, general agent Wells Fargo & Co.

Carson City, Sept. 13, 7.25 a. m., 253 miles, A. C. Cunningham, blacksmith.

Ogden, Nev., Sept. 14, 10.05 a. m., 842 miles, W. W. Fleetwood, clergyman and F. W. Wheeby, dentist.

Laramie, Wyo., Sept. 15, 5.39 a. m., 1395 miles, G. T. Glessner, dentist and E. W. Johnson, undertaker.

North Platt, Neb., Sept. 15, 2.45 p. m., 1560 miles, J. L. Souder and L. A. Spencer.

Omaha, Neb., Sept. 16, 2.05 a. m., 1844 miles, A. P. Ginon, lumber dealer.

Des Moines, Iowa, Sept. 16, 10.36 a. m., 2029 miles, Dr. D. Lecon, automobile editor *Register*, and H. E. Ward, newspaperman.

Joliet, Ill., Sept. 16, 8.25 p. m., 2381 miles, G. S. Jackson, manager Baskiel Motor Co.

South Bend, Ind., Sept. 16, 12 midnight, 2491 miles, J. F. Cole, president National Co.

Buffalo, N. Y., Sept. 17, 2.30 p. m., 2971 miles, H. M. Wall, president New York State Motor Federation.

New York, Sept. 18, 6.31 a. m., James Hemstreet, American Automobile Assn.

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## Signal-Commerce Truck Merger Abandoned

DETROIT, MICH., Sept. 19—The merging of the Signal Motor Truck Co. and the Commerce Motor Truck Co. here under the name of Signal-Commerce Motor Truck Co. has been abandoned. It had been the plan to take over the two properties and incorporate under New York State laws with a capital stock of $600,000, shares of no par value.

Thomas Neal, president of the Signal concern and at one time head of the General Motors Co., was to have been president of the merger and W. E. Parker, president of the Commerce company was to have been vice-president of the proposition.

The two motor truck manufacturing concerns involved in the negotiations will revert to their original individual identities and each will continue to operate separately as heretofore.

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### Ruse, Production Expert, Dies

KENOSHA, WIS., Sept. 16—John W. Ruse, one of the best known production experts in the automobile industry, died here yesterday of acute dilation of the heart after a brief illness. Mr. Ruse was for 8 years identified with the Buick Motors Co. at Flint, Mich., for the last 6 years as general superintendent. Several weeks ago he came here to become associated with C. W. Nash, president of the Nash Motors Co.

# To Vote Fisk Capital Increase

## Meeting Oct. 2, To Decide on Increase of $12,500,000 or Less

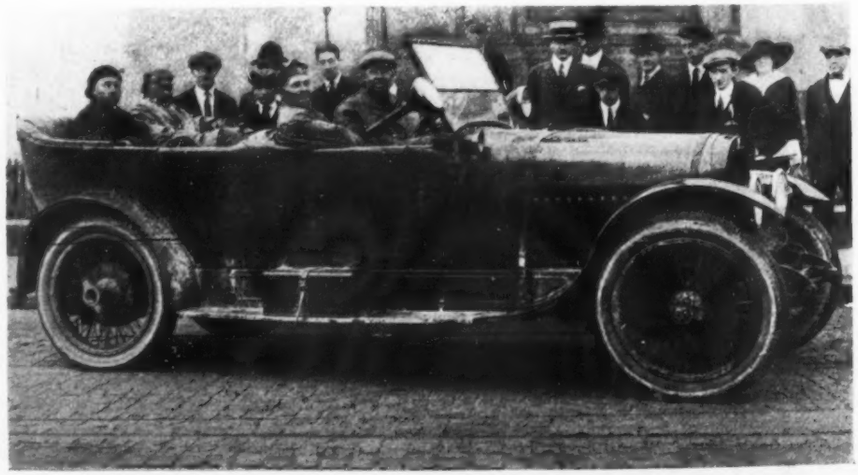
BOSTON, MASS., Sept. 18—Stockholders of the Fisk Rubber Co., will vote at a meeting on Oct. 2, on an increase of capital stock of $12,500,000. Of the new capital, $7,500,000 or less is to be first preferred, and $500,000 or less is to be second preferred.

The stockholders also will vote on authorizing an increase in the common stock by an amount necessary to take care of conversions of existing second preferred and proposed first and second preferred. A proposition to reduce the authorized capital of the company by $5,000,000, the amount of second preferred stock, series B, authorized a few months ago, but not issued, will be submitted.

### First Preferred Convertible

The new first preferred stock, if authorized, may be converted into common stock prior to Jan. 1, 1922 at 125, four shares of common for five preferred, and from Jan. 1, 1922, to Dec. 31, 1926, at $150, four shares of common for six preferred. There is $2,000,000 second preferred stock now convertible into common up to Nov. 1, 1917, and the stockholders will be asked to approve an extension of this period until Nov. 1, 1923.

Holders of the present first preferred stock will be offered pro rata $5,000,000 of the new first convertible preferred at par and accrued dividends, while holders of the present second preferred and common stocks will be offered pro rata $2,500,000 of the new second preferred stock at par and accrued dividends.



Ralph Mulford at the wheel of the Hudson Super-six which established a new transcontinental record by traversing the 3476 miles from San Francisco to New York in 5 days, 3 hr. and 31 min.

# S. A. E. Standards Men Meet

## Straight Side Tires a Standards Possibility—Electric Units Mounting Problems

DETROIT, MICH., Sept. 18—Two meetings of S. A. E. standards committees were held last week. The newly formed tire and rim standards met for the first time and discussed matters relating to pneumatic and solid tires. It was agreed that there are strong probabilities that straight side tires can be made standard for the bulk of the sizes in use, though it is thought the clincher is better for the smallest diameters. There is still some debate as to whether or not the largest sizes in use can be made as satisfactorily in straight side as in clincher. The question will be discussed at the October meeting of the standards committee, which will be held in Washington probably about Oct. 18.

It was reported that the rim situation is improving and that a standard felloe band for passenger car wheels will soon be a practical possibility.

The other meeting was of the subcommittee on the standardization of starting motor and generator mountings. This committee has found its apparently simple task to be extremely complicated, and the members have some of them done a great deal of drafting room work in trying out existing engine drawings against standard mountings. Still more of this work will have to be done before a decision can be reached, but the members are giving so much time to the matter that a report is hoped for at the January meeting of the society. The main trouble is found in starting motor mountings, for the space available is usually much more limited than for the generator. It seems, however, certain that all engine makers will appreciate a standard greatly.

During the coming week the miscellaneous division will meet in Cleveland and the truck standards division meets again in New York before the end of the month.

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### Hatch Heads Perfection Spring Sales

DETROIT, MICH., Sept. 19—Charles Hatch, sales representative of the Perfection Spring Co. of Cleveland for the past 8 years, has been promoted to the position of sales manager of the company and appointed a member of the executive committee.

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### Hubbard Is Harris Engineering Co. V.-P.

BRIDGEPORT, CONN., Sept. 16—Franklin G. Hubbard has resigned as chief engineer of the mechanical department of the Western Electric Co. plant in Hawthorne, Ill., to become vice-president, a stockholder and director of the H. E. Harris Engineering Co., this city. The Harris company, in addition to the engineering business connected with its special machine tool and gage shops, turn out taps, dies, thread gages, ring and plug gages, tapping, grinding and notching machines, etc.

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### Three More M. & A. M. Members

NEW YORK CITY, Sept. 19—The three following concerns have been elected to membership in the Motor and Accessory Manufacturers: Au-To Compressor Co., manufacturer of air compressors, bumpers, tire holders, connecting rods, etc., 233 Mulberry Street, Wilmington, Ohio; F. W. Mann Co., manufacturer of automobile jacks, Milford, Mass.; and West Side Foundry Co., manufacturer of tire pumps, Troy, N. Y.

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### Buckwalter Is Timken Bearing Engineer

CANTON, OHIO, Sept. 16—T. V. Buckwalter has been appointed chief engineer of the Timken Roller Bearing Co., this city.

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### Myers with Fageol Motors Co.

DETROIT, MICH., Sept. 18—Cornelius T. Myers, who is engaged in consulting work on automobiles and tractors here, has been retained as consulting engineer by the Fageol Motors Co. of California. Mr. Myers recently resigned as manager of the Timken-David Brown Co., previous to which time he was mechanical engineer of the General Motors Co.

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### Woodruff Is Simplex Asst. Sales Mgr.

NEW YORK CITY, Sept. 16—The Simplex Automobile Co. has appointed A. A. Woodruff assistant sales manager, with offices at 60 Broadway. Mr. Woodruff will have charge of office routine and system and the spare and repair parts business. He will also remain manager of the body department.

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### Porter Is King Asst. Sales Mgr.

DETROIT, MICH., Sept. 16—Joseph Porter, who has been manager of the King Car Corp., New York City, has been appointed assistant sales manager by the King Motor Car Co., Detroit.

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### Mutual Motors Promotes Two

JACKSON, MICH., Sept. 19—D. B. Williams has been elected secretary of the Mutual Motors Co., this city, and will have entire direction and supervision of sales and advertising. Mr. Williams has been associated with President Handley of the company for several years.

W. T. Miller, formerly connected with the Willys-Overland Co., has been elected treasurer of the Mutual organization.

# Beecroft Talks S. A. in Cleveland

## 75% of S.A.E. Section Attend —Akron and Toledo Well Represented

CLEVELAND, OHIO, Sept. 15—Over 75 per cent of the membership of the Cleveland section of the S. A. E. was present at the opening of the fall and winter season to-night, when David Beecroft, Directing Editor of THE AUTOMOBILE, gave an illustrated talk on automobile conditions in South America. Over 100 lantern slides showing roads, automobile salesrooms, garages, and country conditions in Argentine, Brazil and Uruguay, were shown. Many of the tire interests of Akron were represented, as were factories in Toledo and other outlying towns and cities.

The fact that 8.5 per cent of the entire automobile business of the fiscal year ending June 30 of the U. S. A. was export business shows the prominence which this branch of the work is attaining. The Argentine market for automobiles is particularly attractive to-day because of the poor wheat crop in Minnesota, the Dakotas, parts of western Canada, etc. A poor wheat crop in these sections means better prices for Argentine wheat. How Europe is watching the grain markets in North and South America was well illustrated by the fact that as soon as our wheat reports were published prices in Argentina started rising. One large automobile manufacturer received a cable order from his Buenos Aires representative the following day for more cars. The selling season in Argentina and Brazil opens in November and continues to March, so that any present increase in Argentine wheat is going to have a very substantial influence on the selling of our U. S. A. cars there during the next 8 months.

### Larger Sales Expected

Until a few months ago Argentina had a very large percentage of her last wheat crop on hand. Argentina is not blessed with a great system of grain warehouses at railway depots, as in U. S. A., Canada and Australia. As a result, the farmer has stored much of his crop of the farm, holding it for higher prices. During the last 12 months the Argentine farmer has suffered with his wheat because Europe has been buying from U. S. A. and Canada in preference to South America, solely because of the shorter freight haul between New York or Halifax and Europe as compared with Buenos Aires and Europe. This preference toward North America has held back automobile sales in grain-producing parts of South America, but the present prices show a return to the South American field.

# ACCESSORIES In South America

## Part V

## Co-operative Selling Must Receive More Attention—European Competition Will Follow Close of War

By David Beecroft

*¶ Editor's Note:—This is the fifth of a series of articles embodying the close observations of automobile and general trade conditions in South America made by Mr. Beecroft, Directing Editor of* The Automobile, *during a 10-weeks' trip through Argentina, Uruguay and Southern Brazil. As a delegate of the United States Government and member of the Argentine Return Visit Committee, Mr. Beecroft had exceptional opportunities to become intimately familiar with conditions in South America, and his articles bring out the salient points forcibly.*

CO-OPERATIVE selling of U. S. A. accessories in South America will have to receive more attention than it has in the past. It is too costly for a manufacturer of one accessory to open agencies in South America, but that one maker can combine with six, a dozen or a score of other makers. Such co-operative selling would, in addition to reducing marketing cost, develop a highly-needed brotherly spirit among our U. S. A. manufacturers.

We must largely forget competition among ourselves and keep our eye on international competition. International competition is a new phrase, but it is a stern reality in South American business.

After the war unquestionably the allied nations will among themselves co-operate in every way possible. That program has already been indicated. Our tire makers instead of fighting among themselves for business will have to co-operate to meet the trade war of England, France and Italy.

It would be a good investment for our accessory and parts manufacturers to adopt general policies with regard to South American trade, supporting such policies as work for the general benefit of our goods. There will arise many broad programs of policy that have to be handled and different U. S. A. firms should be a unit in such. Such united action will give our entire accessory trade a status that cannot be otherwise obtained; without such our makers may exhaust their energies in trade strife among themselves.

### We Must Reduce Prices

In the matter of prices and terms of payment this co-operation is essential. Some U. S. A. goods are being sold at too high prices. This is due to their being handled through exporters rather than by the manufacturers direct. As a result our goods are getting and already have a reputation for being high priced. Certain U. S. A. tire repairs are being used solely because the French goods cannot be obtained. The South American dealers know our prices are too high, but they must have the goods. After the war they will go back to European goods just as fast as they can unless we change our policy.

There is a chance, a good fighting chance, that we can hold this trade providing we put our prices at once where they should be. It is short-sighted policy in building up an export trade to exact high prices to-day simply because you can get them, only to lose the trade to-morrow when international competition is renewed. Our makers can arrive at better understandings in the question of price by co-operation, getting together and going into South America with a united U. S. A. price situation.

One of the greatest factors in international trade that we will find of importance in South America is the reputation of our U. S. A. goods. Every firm that gets a bad reputation hurts the entire U. S. A. business. If U. S. A. accessories have a good reputation, then it will be easy to do business there. If our goods have a poor reputation, it makes it harder for every concern to enter that market.

### Enter the Market Directly

There are many U. S. A. lines of accessories on the Argentine and Brazilian markets that are not trade marked goods. There is no manufacturer's name attached to them. The goods are not always reliable. There is often no service connected with them. Often the goods do not arrive in good condition. Sometimes they never function as they are intended to. The net result is a general discredit to our goods.

This has happened in scores of cases. A few examples will suffice: We have told of the shipment of defective hand horns, of poor lubricating oil, of cheap polishes for bodies and metals, and we could cite many others. Not a single one of these lines was trade marked. The Argentine did not know who made them. To him they were U. S. A. goods and you could scarcely blame him for gaging all of our accessories on their plane. We would do the same thing. This must be avoided. How?

The quickest and best way to overcome this deplorable situation is for our makers to enter the market directly. We must let the South American people know who are our big reliable markets. We must let them know that we make goods to which we are not ashamed to attach our names. We must let them know the good brands we manufacture. We must let them know that these non-trade marked goods are our poorest lines, not our good lines—let them know that we

have a big army of accessory makers of high business caliber.

We must go further: Often some of our best U. S. A. lines are poorly handled in Argentina and Brazil, although they are excellently handled in U. S. A. This is generally due to the goods being shipped abroad through exporters. Naturally the exporter has not the same single interest in any accessory that the maker has. To the exporter any accessory is only one of hundreds of different lines he exports. The exporter does not understand the line the same as the maker. Often the exporter ships goods not well suited to the needs, and naturally the reputation of U. S. A. goods suffers. Here is an example:

A large Brazilian automobile dealer, to get the agency for a certain Detroit make of automobile cabled his exporter in New York to ship him five or six cars. If they turned out well he would secure the agency. The exporting house shipped a couple of coupés, one sedan type, a runabout and a touring car. The only model that was of any use was the touring car. There was no demand for coupés or sedans. There was no demand for runabouts. The demand was only for touring cars. The net result was that the dealer did not close the agency. He blamed our maker for the shortcoming of the exporter. Our international reputation suffered. Search revealed the fact that the exporter got a special price on the lot.

Here is an example from the accessory field: A supply house wanted hand horns, and the exporter shipped electric motor horns. The electric horns were no good without batteries, but as the supply house wanted to sell the horns for European cars using gas lighting, the motor-driven horns were no good. Here again our international reputation suffered and it always will suffer so long as our business is done through third parties who are not close enough to the needs of the industry to know best what line of goods is best suited for the case. It is for this reason that our makers must give the matter more attention.

What is true in South America in this accessory matter also applies to Australia and South Africa. Recently we talked to some of the largest dealers from Australia and South Africa and they both told us the same story. Our makers have a notoriously bad reputation as exporters. We are the laughing-stock of the world. Too many of our makers have no conception of the magnitude of foreign business. Here are two examples given in the last few weeks:

### Foreign Trade Underestimated

One of our manufacturers sold the entire right of selling his accessory in all British South Africa for one trifling order of $120. This represented just twenty of the accessories in question. The South African jobber cabled for an order of several thousand within 3 months. The original order of twenty were sold in less than a week. Here our manufacturer gave away a good business investment, because he had no conception of the field.

Another example of similar bad business was where the sole right for an accessory was sold for $160 for an entire continent.

Both of these examples represent the other extreme, but they go to show what a poor grasp we have of the exporting business.

Some of our largest accessory makers in U. S. A. are not in any of the foreign markets direct, but are having their lines handled through exporters. In some cases these goods have a very unsavory reputation. In the words of one large foreign jobber, "some of your goods literally stink because of the way in which they are handled abroad." This foreign jobber mentioned half a dozen lines of accessories that are not getting established abroad for this reason. Here in U. S. A. they are our biggest firms.

As accessory makers we will have to do the same as older business concerns have done, namely, establish our own agencies direct or open our own branches. We have accessory houses that are larger than many old established lines controlling their own foreign business. Look at some of these that have their own arrangements and who are literally saving our U. S. A. reputation abroad.

Fairbanks Morse, Singer Sewing Machine, National Cash Register, Remington typewriter, Underwood typewriter, International Harvester, General Electric, Westinghouse, U. S. Steel Products Co., Corbin Screw Corp. and many others are our trade stalwarts in South America. They have found it worth while to send their best men there. These firms have not only built up a reputation, but they have spent millions to establish what standing we have as international traders.

### Must Do Our Share

The automobile industry is duty bound to give these firms its support. There is no question but that we will be strong in that market, but we must carry our due share of the load. Bowser has an agency for its tanks in Argentina and already has established itself in the market. A few of our makers of dry cells have Argentine agencies and nothing but favorable comments are heard regarding their business arrangements. Our largest tire makers are establishing themselves in first-class manner, and they merit credit for what they have done. But there are too many of our accessory people who have not awakened to the situation.

### Wider Representation Needed

We have not to-day a wide enough representation in such lines of accessories as speedometers, batteries, spark plugs, jacks, horns, polishes, bearings, vulcanizers, wrenches and other lines of tools. Many other lines can be added.

Before concluding this series on accessories there are a few other lines that should be included with those referred to in previous articles. There is a strong demand for top materials, providing they are cut for several of the best U. S. A. sellers. Tops wear out very quickly in Argentina and Brazil and the owner wants top materials all cut ready to be applied. This is true with regard to Ford, Overland, Studebaker, Hupmobile, Buick and a few other makes and will be true with regard to many more different makes within the next year or so.

Several of our magneto makers are already well established, Bosch and Splitdorf being represented. Eisemann has representation through France. Our concerns making electric starting and lighting apparatus are not strong. There is scarcely any carbureter representation, and as near as we could discover the European carbureter is much more firmly established than our own. Several of our own makes are scarcely known and some never heard of. With many of our cars selling in those countries there will be marked development in the carbureter possibilities. The same applies to rims, clocks, shock absorbers, and every line of accessory that is going to add to the utility of the car.

Manufacturers of raw materials will find a good market in Argentina, Brazil and other Latin-American nations. Every large supply house in addition to accessories carries a heavy stock of blanks from which spur and bevel gears of any size can be made.

There is a big supply of gaskets, assorted nuts and bolts, spring clips, bar and sheet steel stock, door hinges, door handles and, in short, everything needed in the automobile. Keep in mind that South American countries are not manufacturing nations, and so practically everything must be imported. The supply houses handle not only accessories, but raw materials as well. Often raw materials occupy as much space in a store as accessories.

In conclusion: The field is there. Let us possess it as it should be possessed.

# Tractor Drives Knotty Problem

## Advantages of Caterpillar, Two-Wheel and One-Wheel Drives Appear to Depend Upon Nature of Work—Difficulty of Choosing Best Place for Weight

By A. Ludlow Clayden

Left—Large Case tractor, showing the sort of treads used to give a grip on plowing land

Below—The "Happy Farmer," a tractor in which the weight is very little forward of the driving axle

*¶ This is the third of a series of articles based on an intimate study of tractor requirements and the efforts of the tractor engineers to meet the problems in design and construction arising from the demands made upon the machines in active service. The author has been in close touch with the tractors and the manufacturers at the recent demonstrations, so that this series of articles accurately reflects the conditions discussed, besides giving a clearly defined idea of the principal trends in tractor engineering.*

IN a previous article the writer touched upon some of the high spots in the design of engines for tractors, and H. L. Horning of the Waukeshaw Motor Co. has contributed much valuable detail information on the same subject in his recent S. A. E. paper, the third installment of which appears in this issue of THE AUTOMOBILE. A matter on which there is even more difference of opinion, and which is far more difficult to argue about is the best form of wheel or drive arrangement for tractor service.

At present we have almost all possible arrangements. One wheel with a pair of small wheels, one to steer and one to maintain balance sideways, is used by some manufacturers, this being called the drum type. Then we have two driving wheels with either one or two steering wheels that are supposed not to carry much of the weight. Then come true three-wheel and four-wheel machines with a fair proportion of the weight on the steering wheel or wheels, and finally, there is the track-laying type with the wheels inside an endless chain which is placed on the ground and rolled over by the wheels. There are also machines with a track-laying arrangement for the drive, and a wheel or wheels to steer and carry part of the weight.

The track-laying type is usually known as a caterpillar, although this particular phrase is claimed to be the property of one firm and so not available for general use. However, it is the term commonly employed and will therefore be used by the writer in dealing with all applications of this kind of drive.

It is unlikely that one form of drive is the best for all purposes; there are reasons which make different designs most suitable for different circumstances. For example, there is nothing to compare for a moment with the caterpillar for operation on very soft ground. The unit pressure is small and the tractive grip the maximum possible for the weight of the machine; so on peaty soil or sand or for hauling guns through wet dirt there is nothing which will compare with the caterpillar, yet for use on hard ground it has drawbacks which make the wheel design preferable.

However, to look at the fundamentals of the problem of choosing a drive, we have first the necessity for providing enough grip between the drive and the ground to prevent the slipping of the drive by the engine under any circumstances. The caterpillar offers the maximum traction having one surface in contact with the ground and all the weight upon it. The automobile offers the other end of vehicular range with

small surface and half the weight on it. Average tractor requirements are somewhere between these two extremes.

As a second requirement we need a drive, if we can get it, which will have a tread no wider than the strip of earth that can be plowed. If we can pull four plows, the drive ought not to be more than four plows wide, six plows and it can be half as wide again and so on.

Third, we want a direct pull for the plows, the center line of the drive should also be the center line of whatever the tractor is pulling, thus avoiding side draft, which is obviously wasteful of power.

Fourth, if we do not need the extreme limit of the caterpillar we still want sufficient area of contact on the ground to provide traction on moderately soft earth.

Fifth, we want ability to turn in a small circle, a very small circle, so as to facilitate maneuvering in confined spaces and to allow plowing to be carried as near as possible to the limits of the field.

### Drawbacks of Caterpillar

Before passing on to the consideration of wheeled machines, the drawbacks of the caterpillar type may be mentioned, because this is the ideal for traction per pound of weight and for maneuvering, because by going ahead on one tread chain and astern on the other it is possible almost to spin around the caterpillar in its own length.

The difficulties are mechanical. Obviously a steel chain must have links and links must have bearings. A steel chain to be efficient and to have long life ought to be inclosed in an oil bath; it most certainly ought not to be forcibly charged with mud and sand. Thus the work absorbed by the caterpillar tread is considerable, and the life of the chain is not all that could be desired. For steering we must drive one side more than another, so that directional control is somewhat complicated, and finally, the chain tread is rather expensive, and cannot well be cheapened if it is to last reasonably well in service.

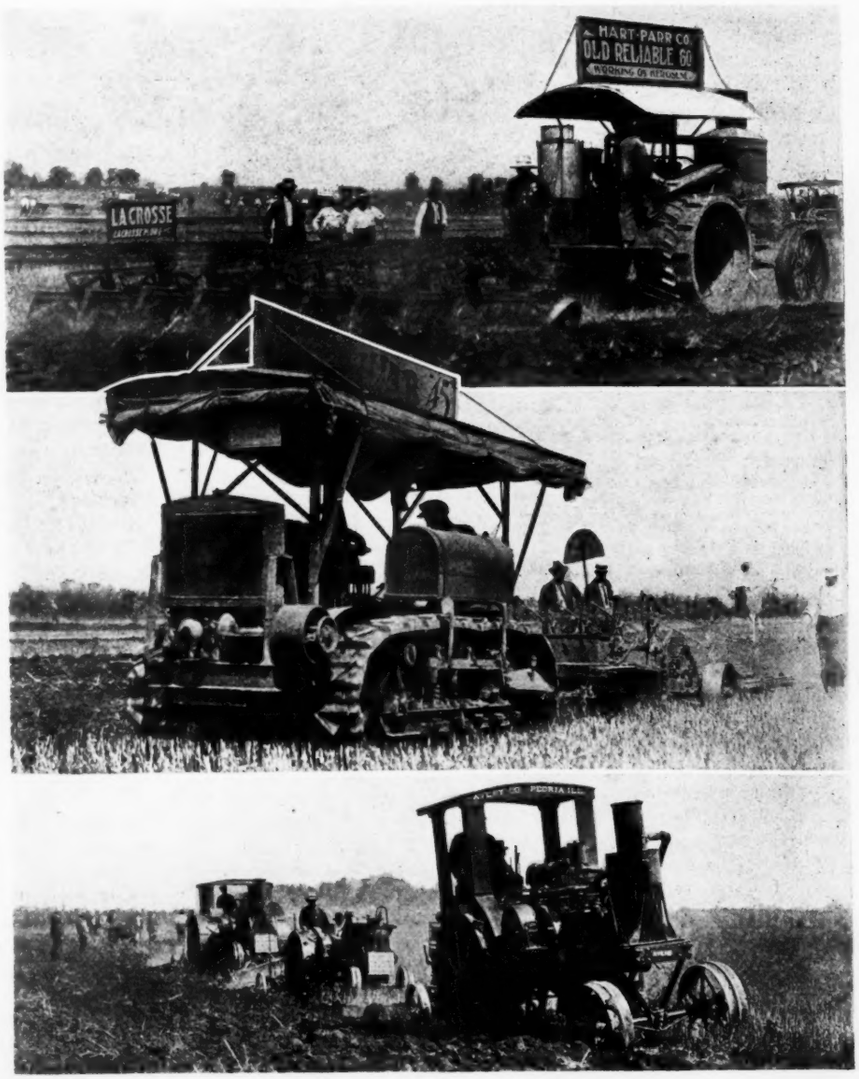
This is not an indictment of the caterpillar, it is merely a brief summary of its drawbacks. It is probable that means could be devised for rendering the bearings in the chain tread perfectly dirt-proof and thus increasing the efficiency and the life of the chain. Really the caterpillar seems to be a particularly promising type of machine which will develop into something far better than it is to-day. Numbers of the machines are being used where they are the only thing that possibly could do the work, and the experience gained will be valuable in bettering the design. Thus it is hardly possible properly to fix the place of the caterpillar in the tractor world at present; it will not be possible for some time to come, it may even be 10 years before the type is developed fully.

There is another sort of machine using a caterpillar drive in conjunction with wheels. In this a small chain tread assembly with two wheels is located suitably for driving and the weight is balanced, partly supported and steered by wheels. This system gets away from the complicated steering of the full caterpillar and provides a good driving grip without the use of a very large and wide driving wheel or wheels. The chain being smaller is less costly to renew when worn out, so that this design may possibly develop along with the full caterpillar.

A possible trouble with a large and powerful tractor might be to get enough weight balanced on the tread; in other words, there may be a limit of size where the caterpillar drive with wheels for steering would be no better than an all-wheeled machine on traction and general convenience.

### Drum Suits Small Power

In the drum type of tractor there is one large wheel with the engine and gearing located as close as possible to one side of the wheel. There is then a smaller side wheel which does no driving, but carries a little of the weight, just enough to allow the tractor to lean over in the direction away from the side wheel without overbalancing. A third wheel somewhere ahead does the steering.




Upper—A large tractor hauling eight plows wider than itself. The extension pieces on the wheels to give support for the weight in soft going should be observed

Middle—The Holt caterpillar with weight distributed evenly over the whole tread of the chain

Lower—The big Avery in the foreground has the weight well in front of the driving axle of the machine


Upper—The Bates Steel Mule has a caterpillar rear drive and the two front wheels are for balancing the weight and steering. Only a part of the weight is on the driving member, yet the traction is sufficient for all purposes

Lower—An example of the drum type where the drive is taken through a single large wheel, the weight being balanced by a side wheel and partly supported by a front wheel which does the steering

The advantages of this design for small power is that the one big wheel does not need to be wider than the strip that is covered by the plows the machine can pull, which means that no driving wheel has to run on ground already plowed. Against this advantage may be balanced the drawback noticeable in drawing harrows or other cultivating machines, for then the drum packs the earth in strips a few yards apart and the light dragging of the wide machine being towed is not enough to unpack the soil. This, however, is also true of all other types of tractor, and the packing caused by a drum is no worse than that caused by two wheel drives if the unit pressure is the same.

Another advantage of the drum type is that there is no need for a differential, there is no rear axle in the ordinary sense and the engine and gearing can be arranged compactly. Also, not being between two big wheels, the powerplant can be very accessible and yet have the bulk of its weight concentrated on the driving surface.

**Required Driving Pressure**

Before proceeding with this analysis of drives, it may be well to mention the amount of unit pressure required to give the requisite tractive effort. At present this must remain something of a guess, it is not possible to say that it must be just so many pounds per square inch. However, it is a fairly safe rough and ready rule, with wheeled drives, to say that the weight must be equal to the tractive effort.

In considering tractor engine requirements it was suggested that at least 1000-lb. drawbar per plow was necessary, so this means for each plow pulled the weight on the driving wheels should be 1000 lb. Some engineers think this amount too much, others say it is too little, and this again is a matter that experience must decide.

However, whether we accept the 1000 lb. or not, this does not help to settle the proper width of wheel. The traction depends upon the pressure, not upon the area, so a large area with small unit pressure has just the same tractive ability as a small area with higher unit pressure, as long as the nature of the surfaces in contact is the same. What is necessary is to have the wheels so wide that they will not sink into soft earth nor have too powerful a packing action on freshly plowed soil, which means they should be as large as possible. Against large size is weight, for the big wheels are not light and there is everything to lose and nothing to gain by making the total weight on the drivers more than that required to give traction enough for the plows.

Of course, the co-efficient of friction between the wheel and the earth is very high, and it is customary to increase it greatly by putting studs in the treads or bars across them. There is no difficulty in using high unit pressures and small wheels on dry earth, but a small wheel will soon dig itself in on soft going. Here we see the advantage of large diameter as compared with great width, for the big wheel will roll out of a deep hole that might engulf a smaller one. Getting a tractor weighing 4 or 5 tons out of a hole in a soft field is somewhat of an undertaking if another machine is not on hand to do some towing.

Really for wheel diameter and width little more can be done than to refer to current practice and then experiment, but a good deal can be done in utilizing the weight of the engine and transmission to better advantage. In the diagram, Fig. 1, suppose that the driving wheel has a center $O$ and that the drawbar pull $P$ is applied at radius $r$. Then, if there were no other wheels, but the power plant had all of its weight on the one axle $O$, obviously it would have to be located back of the axle with the center of gravity at $W$, so that $Wr1 = Pr$.

If the weight is further forward and there is a front wheel to support part of it, the effect of the $P$ is to throw a reactive pressure on the front wheel. In Fig. 2 obviously $Pr + Wr1$ must equal $pr2$ where $r2$ is equal to the wheelbase of the machine. In Fig. 3 we have the steering wheel behind, and then the effect of the pull $P$ is to lift the rear wheel; when $Pr = Wr1$ then $p = O$.

We can thus say that we are utilizing the weight best when it is back of the driving axle, but if it is in this position it must be a good way back so as to maintain enough pressure on the steering wheel to give a grip and prevent the wheel from being lifted off the ground. Even then striking a stump might cause the whole mass of the tractor to revolve around the axle.

If the weight is in front it is not being utilized to best advantage, but we have safety and can be sure of steering grip. If the weight were right over the rear axle so that it was balanced there with no drawbar pull, we should have the condition of $r1$ equaling $O$ which is the best compromise. Here again it must not be completely balanced or there will be no steering grip when the tractor is running by itself and no stability to prevent it turning backward around the axle should the front wheel strike a bump. Therefore the conclusion reached is that the best place for the center of gravity of the engine, transmission, etc., is just sufficiently forward of the driving axle to give steering on the front wheel.

From this elementary bit of mechanics it is possible to see where the caterpllar scores with its small wheels, for small wheel diameter means that the radius $r$ is also very small. If we could get $r$ down to $O$, the pull $P$ does not disturb the balance of the weight in the slightest. It also follows that

the larger the wheel the more difficult it is to find the best place for the center of gravity, to suit all conditions and without wasting weight that might be utilized in obtaining tractive effort. There appears to be something in favor of a four-wheel layout with two driving wheels and two steering wheels, one in front and one behind. Here the weight could be poised so as to have the best effect at the maximum drawbar, and one or other of the small wheels would balance the machine under other conditions. There is no doubt, though, that three or four wheels with the steering in front and the center of gravity a little forward of the driving axle makes a quite satisfactory compromise.

In practice there is a very great deal of variation, and it is impossible to escape the conclusion that not all tractor engineers have given this question of weight distribution the attention it deserves. As long as there is enough weight for driving and steering every additional pound is dead weight, costing many dollars a year to carry about and something in first cost. In most cases the wheel size necessary will force the wheels to be fairly heavy in themselves and the rest of the machine should only add just enough more weight to bring the total up to the amount of the maximum drawbar the machine can exert.

Turning to a matter of detail, it is noteworthy that the suspension form of wheel is greatly used for tractors, though the tangent spoke principle has apparently been neglected. If a wheel is to be a tension wheel it can be built lighter for the same strength if it is on the tangential spoke principle.

### Improving Wheel Tread

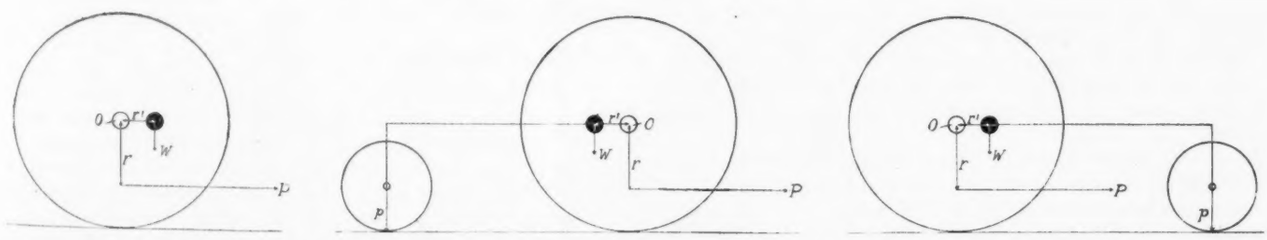
A wheel detail that seems capable of improvement is the method adopted for attaching the bars or studs to give traction on softish dirt. If tractors with studded wheels are run on macadam or other hard roads the destruction caused will be indescribable, yet the farmer wants to be able to use his tractor on road or farm. Thus it ought to be easy to change from the field tread to a smooth tread quickly. Many tractors have angle iron tread bars about 12 in. apart all around the driving wheels, each being attached by two or three bolts and nuts, to remove which would be three hours' work or more for one man. Similarly the studs often employed are each fixed individually. There ought to be some way of applying the whole rough tread for field work in two or three sections per wheel, so that the tread could be put on or removed in minutes instead of hours. There is no great mechanical difficulty to be overcome and such provision would meet the road destruction question before it actually arises; surely this is well worth while.

A way of fitting a rough tread which suggested itself to the writer and seems to have some possibilities, would be to make the tread in sections say a foot long, the sections being linked together by hinge pins so that the whole tread made a kind of chain. This could be laid on the ground flat and the tractor driven onto it, then the ends could be lifted up and the tread tightened on the wheel by some sort of turnbuckle which would cause it to grip. Probably some driving catches or dowels would be necessary at several points on the tread, to prevent the wheel tending to turn within it. Even if this suggestion is not practical, and very likely it is not, there ought to be some equally simple method that could be developed.


A typical four-wheel tractor with the weight well forward of the driving axle

At present all the two-wheel drive machines have a differential, and they could not be operated without one, but there is a prevalent opinion that a differential lock is an essential attachment, and that few tractors will be made without this in the future. Considerable interest is being taken by tractor men in the various differential gears that have recently come to the front and have the power to prevent the spinning of a wheel that loses traction. If one of these works out satisfactorily in tractor service it can have the whole tractor market, and the makers of such differentials would probably find it well worth while to make a special bid for this large and growing field.

Automatic steering has been sought on a good many of the small tractors, the idea being to allow the driver to relinquish the wheel in order to attend to his plows. Steering in such case is effected by a small wheel that runs in the furrow, while plowing, and has a link connecting to the steering gear at some convenient point. In the field these devices appear to operate very well indeed, and, even if two men are working together, there is no object in compelling one of them to hold the steering all the time if that is not really necessary. The additional amount of mechanism is small, the cost negligible and the added weight also too small to be of any account, so there is no obvious reason why automatic steering should not be used even more extensively than it is. Of course, it is more readily applicable to a small machine where the amount of force needed for steering is small than to a big machine.




Left—Fig. 1—With a driving wheel center O and drawbar pull P applied at radius r, all the weight of the power plant being on the one axle, the center of gravity would have to be behind the axle at W. Center—Fig. 2—With the weight farther forward and partly supported by a front wheel the pull P throws a reactive pressure on the front wheel. Right—Fig. 3—With the steering wheel behind pull P tends to lift the rear wheel

# Temperature Control Will Be Elaborate

## Need for Different Temperatures in Different Parts of Automobile Engines Will Lead to Many Automatic Devices is Opinion of Detroit Meeting

C. F. KETTERING, the man who held the rapt attention of the S. A. E. for a whole evening while he lectured on scientific matters on the Noronic last June, started a wonderfully interesting discussion at the opening meeting of the Detroit section of the S. A. E. on Sept. 14. He read no paper, nor did he speak from notes, but simply talked for an hour on the problems of temperature control in automobile engines, citing the difficulties and hinting the methods by which they may possibly be surmounted.

The conclusions reached after the lecture and the discussion were that heavy gasoline would compel temperature control on automobile engines, and that such control would probably extend beyond that of the water temperature alone. Engineers were started along the line of thought required to bring definite results, and a whole field of necessary investigation was opened up.

The conclusions were indefinite, that is to say no participator in the discussion could say just what ought to be the temperatures of different parts of an engine; perhaps the most immediately interesting part of the proceedings were the remarks made regarding the problem of starting from cold, C. F. Kettering suggesting the use of electricity and Howard Marmon the employment of a burner or pilot light to bring the carbureter and cylinders up to proper operating condition. The drawbacks of over heating were given attention as much as those of under heating and it is safe to say that hardly a man of the large roomful present but went away with his mind set on a problem he had so far considered in only a cursory sort of a way.

### Heat for Vaporization

Kettering began by pointing out that a certain amount of heat is necessary for vaporizing any liquid fuel, that an engine burning so many gallons of gasoline per hour requires so much heat to be taken from somewhere in order to vaporize that gasoline; a perfectly definite quantity independent of anything else.

Kerosene requires more heat than gasoline, of course, but the amount needed is still constant for a given bulk of fuel. With light gasoline, like we used to have, the heat could be taken from the atmosphere over a wide range of air temperatures. But this is no longer the case. We must get extra heat from somewhere. Electricity, the ideal form of energy for easy control, was out of the question, far too much heat is required to vaporize heavy gasolines. Also we are now wasting about 50 per cent of the total thermal value of fuel in the cooling water and another 40 per cent in the exhaust gas, so we have only 10 per cent left and do not want to use any of this for vaporizing the fuel. We may either take from the waste heat of the water or of the exhaust for that purpose.

Later on in his discourse Kettering mentioned that electrically derived heat might be used for heating up a carbureter previous to staring, that is, before exhaust heat was available.

### Ill Effects of Condensation

There are bad effects through not heating the intake gases sufficiently, effects that may cause actual damage to the engine. In a heavy gasoline, such as is being sold to-day, there are still some light fractions, added to bring down the gravity of the whole. In starting, or in running with an intake that is too cold, these light fractions are vaporized by the heat of compression and burnt out of the gas mixture during combustion, leaving the heavy fractions partially unconsumed.

This action causes a condensation or deposit of heavy kerosene which dissolves in the lubricating oil, thinning it and reducing its lubricating properties, and long continued running with this action going on will certainly cause cylinder and bearing wear. (This has been found to be particularly true with tractors running on kerosene, and for such machines it is recommended that all the oil in the engine be thrown away after 10 or 15 hr. running.)

### Running on Half Throttle

A similar effect is obtained by running on half throttle, as most cars are driven most of the time. The depression in the intake caused by the throttling causes wet deposits of fuel to be made in the intake passage; these get into the cylinder and the evil effects of the heavy fractions are noticed. The only way to prevent this condensation is so to heat the manifold that it will supply enough heat to the fuel to keep it in gaseous form. The fuel must not only be made into a gas while in the carbureter, but must be kept in gaseous form while passing through the manifold into the engine.

Granting that once the engine was well warmed up it would run on quite heavy fuel, as long as proper heat for vaporization was supplied, Kettering turned to the problem of what constituted a fuel on which a start could be made from cold. He stated that, at normal air temperature, a fuel consisting of 1 qt. of 60 Baumé gasoline mixed in 5 gal. of 46 to 47 Baumé kerosene would enable starting to be performed, the light fraction doing all the work till heat was available to warm the carbureter and manifold. Such a mixture is just about the equivalent of 54 Baumé gasoline.

A method of supplying heat that has been tried and may have some usefulness is to warm the bowl of the carbureter, heating the fuel till its specific gravity is reduced to the desired Baumé. This, however, is not the equivalent of supplying heated air, as the warmed fuel can only hold enough heat to provide a small portion of what is required for total vaporization. Thus we want hot air, but not too hot because by decreasing the density of the air we reduce the weight of air and fuel that the cylinder can draw in, and so cut down the power possibilities of the engine.

### Water Heat Insufficient

To get proper vaporization under all circumstances with heavy fuel it is not enough to control the temperature of the water in the cylinder jackets. It will be necessary to control the temperature of the fuel itself and also of the air entering the carbureter, if we are to get ideal results. The kind of thermostat now being employed for water control is very powerful, though small in size it can exert considerable pressures and could be used for operating all sorts of mechanisms, so there ought to be no very great mechanical difficulties in the way.

The use of a mechanism to control water temperature for

internal combustion engines is not new, as long ago as 1885 a device had been patented for use on stationary gas engines which had as its purpose the maintenance of a constant jacket temperature. Other inventors had followed, the designs growing simpler and more effective, so it is rather remarkable that it is only recently that any attention has been given to this matter in the automobile field.

J. G. Vincent, Packard Motor Car Co., opened the discussion by saying that he had 2 years' experience of thermostatic control of cooling water and his work had shown him that there were slight differences in effect, according to where the thermostatic valve was placed. With the thermostat at the bottom of the water system it controls the temperature of the water entering the cylinders, but when placed at the top of the radiator it controls the temperature of the water leaving the engine jacket. While there might seem to be little difference, there is really a good deal.

Under normal operating conditions the amount of difference is small, but in cold weather the engine with the thermostat controlling the outlet from the cylinders where the water goes into the radiator, there is a considerable difference in the time taken to warm up the cylinders to proper working temperature.

### Thermostat Operation

With the bottom position for the valve and thermostat it was set to close at 115 deg., and to open at 125, keeping the water at the bottom of the engine jackets at about 120 deg. What will then be the temperature of the water as it leaves the jackets at the top is variable, depending upon the weather.

On the other hand, if the thermostat and valve are at the top, so that the valve controls the outflow from the engine, then it would be set to open at between 160 and 170 deg. Until this temperature is reached no water can escape from the jackets. As the water grows warmer it rises into the cylinder heads and is trapped there till such time as the thermostat opens the valve.

Thus with the thermostat at the top the temperature of the cylinder head cannot be less than the required amount, but when the control is at the bottom the water in the heads may be too cold. Furthermore, with the top position the water cannot get any hotter than the set point (160 to 170 deg.) while it may get too hot if we control the bottom part of the system.

The engine warms up much quicker with the valve at the top, and tests showed a Packard engine would come up to working heat in 1½ min. with zero atmosphere. Vincent called attention to the fact that the valve must be tight if it is to be of any use.

### Radiator Shields Alternative

Several Detroit manufacturers are now trying out a device consisting of a number of shutters mounted in front of the radiator which can be closed or opened by the action of a thermostat. Mr. Lewis, the Detroit Motor Appliance Co., interested in this device, called attention to the fact that it nullified the effect upon the water in the radiator of varying wind conditions. He allowed that heating up after starting would be slower when the whole body of water has to be warmed but thought there were advantages in having the radiator kept automatically from becoming too cold. A. P. Brush, who spoke later, also pointed out that one desirable effect of a constantly warm radiator was to heat the air which the carbureter was taking in, and so utilize some of the heat wasted in the water for performing a desired function.

A. Ludlow Clayden, THE AUTOMOBILE, spoke concerning the effect upon the problem of intake gas velocities. In attempting to carburate heavy fuel we have only the atmospheric pressure of 14.7 lb. per square inch to drive the air past the nozzle and so atomize the fuel. As atomization becomes more difficult carbureter makers are cutting down the size of choke tube so as to increase the velocity past the nozzle, and this increases the depression in the manifold and so aggravates the trouble of condensation.

### Gas Velocity a Factor

Particularly in using kerosene it is noticeable that we require more heat for the intake manifold at low throttle, when less is available, and less heat at high throttle, because the tendency to recondense after atomization is increased as the depression in the manifold is made greater. It would therefore seem that there might be good reasons for controlling the amount of heat given to the manifold in proportion to the speed of the gas passing the carbureter nozzle.

He added that electricity seemed to be the ideal energy supply for warming up for starting purposes, and asked Mr. Kettering if the amount needed to warm the bowl of the carbureter sufficiently would be too heavy a demand on the battery. This question was afterwards answered to the effect that the current required would be some 30 amp. for about 2 min. duration and therefore not beyond a battery's capability.

F. O. Ball, Ball & Ball Carbureter Co., stated that he had made some inconclusive experiments with integral intake and exhaust manifolds and was continuing these in the endeavor to discover what the intake temperature ought to be.

K. W. Zimmerscheid, General Motors Co., said that we were always likely to forget that gasoline and air must be mixed by weight and not by volume and that when we heated either, so altering its specific gravity, we upset volumetric metering set for different temperatures. He considered 170 deg. the ideal water jacket temperature and thought 140 deg. about the right temperature for an intake manifold. In arranging for heating the air taken in, the fact that we had to start with cold air must not be forgotten. He considered the best temperature for the entering air would be 120 deg. The fuel ought to be kept at a constant temperature. If the carbureter were insulated from the cylinder block by some nonconducting material it would be easy to control its temperature by means of a thermostat, using an individual water jacket for the instrument. Possibly a carbureter maintained at 120 deg. and an intake manifold at 180 deg. would be correct.

It was also desirable to prevent the temperature of the oil from falling too low. There is always risk of getting water in oil through condensation of the products of combustion that get past the rings and pistons. Probably this water passes the pistons in the form of steam, and, if the crankcase is warm, it will not condense, perhaps, but will have a chance to escape through the breather.

Howard Marmon, Nordyke & Marmon Co., said that the starting trouble was one of the worst the industry had had to face. He found himself wondering whether the simplest solution of the difficulty would not be to use a blow torch or pilot burner playing on the manifold and carbureter to warm them up to working temperature. A. P. Brush, Brush Engineering Assn., who followed, mentioned that small quantities of light spirit would always be available, and it would be comparatively simple to use a small tank of good gasoline to start and warm up, switching over to the heavier fuel when the desired temperature had been attained.

### Power of Thermostat

D. McCall White, Cadillac Motor Car Co., said that E. E. Sweet of his company began experiments in 1907, and it was his tests that led up to the adoption of the thermostat by the Cadillac company. He gave several tabulations showing the characteristics of the thermostatic unit they employed. The following table shows the amount of expansion at different temperatures:

(*Continued on page* 482)

# Truck and Tractor Engines—Part III

## Water Pumps and Engine Cooling—Governor Design a Difficult Problem But Essential—Engine Lubrication—Application of Tractor Engines—Liberal Allowances Necessary

By H. L. Horning
*Engineer and General Manager Waukesha Motor Co.*

*EDITOR'S NOTE.—This is the concluding installment of the paper Mr. Horning read at the third quarterly meeting of the Midwest section of the Society of Automobile Engineers held in Milwaukee, Wis., Sept. 1. Previous installments illustrated the differences in the demands on engines for trucks and tractors, outlining some of the more serious problems the engineer has to face in meeting them.*

COOLING passenger-car engines sometimes is a serious problem. Cooling is the greatest problem in tractor engines. There are so many variables that little reliable information can be given as to water circulation or radiator capacity. Each individual case seems to require its own treatment. A tractor may be sent to Alberta or to Texas, and the extreme conditions determine the radiator capacity as well as the water pump.

The following limits may serve as a rough rule for water pump capacity:

$$G = \frac{B.H.P.}{V} \qquad (5)$$

In which G = gal. per min. water pump discharge through outlet to waterjacket.

V= Variable depending on engine and radiator design. For poorly designed combination V = 3.5. For a very efficient design V = 4.5.

There are some tests being run by a well-known company on the capacity of different type radiators and fan designs for tractor service which will be available soon, and which will constitute the only complete information available.

### Manifolds

The only change manifolds require for truck or tractor service is in the intake, which should be smaller than usual, due to the low maximum speeds of engines and to the poor quality of fuel. The following formula for truck or tractor intake manifolds on egines up to 5-in. bore results in gas velocities which give good results for engine speeds encountered in these services and are correct for the poor gasoline and kerosene service:

$$I = 0.3\ B \qquad (6)$$

in which I = core diameter of intake manifold. Exhaust manifolds outlet cores have diameter corresponding approximately with the following formula:

$$Ex = 0.5\ B \qquad (7)$$

### Governors for Truck and Tractor Engines

Governors must be installed on trucks primarily to prevent them from racing. Truck users have found governors useful to maintain the maximum speed of the trucks so as to give the driver both hands and feet for driving on straightaway work. It has been found that constant-speed governors help to keep up the maximum speed of the truck or make a truck average more miles in a day.

Governors for tractors are constant-speed type and usually are of the flyball design, which act directly on the butterfly throttle.

By far the most satisfactory arrangement for governors is to build them into the engine and to have them lubricated by the engine lubricating system.

Time will not allow a discussion of governor design other than to say that it has been the most difficult phase of truck and tractor engines, with which the writer has had to contend, and yet the most essential. Experience indicates that the flyball type is the most practical and easily understood by the average user and any form of this should prove satisfactory if built with ample bearings and wearing parts. Experience is such as to indicate that the butterfly is the most difficult form to use while being the easiest to manufacture.

A paper before this Society on governor forms, in the writer's opinion, is the best that has been written.

### Lubrication of Truck and Tractor Engines

Generally speaking, the difficulty in lubricating tractor engines efficiently is second only to lubrication of racing engines. They are operating between the speed of maximum torque and maximum economy, a range in which the greatest heating occurs, which is directly responsible for most failures in tractor lubrication. What is true of tractor engines under 50 hp. applies with equal weight to truck engines.

Lubricating systems for both services are no different than found in passenger-car service with the exception that greater care must be taken to insure an abundance of oil at all times and to see that the system is such that if one point fails other parts will contribute oil to prevent sudden failure, but not sufficient for extended service.

To illustrate, one engine is equipped with a lubricating system that is so designed that if one connecting-rod pocket fails to get its oil, the adjacent rods supply enough to spread the development of a knock over 2 days' time so that it can be heard and corrected before full failure. Most oiling systems fail so quickly at one point that there is no chance to catch the failure in time. Truck engine bearings fail for lack of proper oil and from the above cause. Successful lubrication of heavy-duty engines imposes two functions on the oil.

First, to make an oil film between wearing surfaces.

Second, to act as a conveyor of heat. As the duty of an engine increases it is hard to tell which is the most important. The writer thoroughly believes in the great benefit derived from a large quantity of oil washing the heat from the lower part of the cylinders and crankcase into the lower pan, where design should promote dissipation of this collected heat.

The importance of an abundant screen area for very thoroughly straining the oil becomes of great importance in heavy-duty work.

Geared oil pumps have been found to be the most satisfactory and dependable in service; the only points where they fail is in leakage of oil, both internal and external, and being not sufficiently large for the service.

Proper lubricating oil for heavy service seems to be one important insurance for long life.

The following general classification of oils manufactured by leading oil companies seems to fit the requirements and is given here rather than a scientific statement of oil characteristics. Oil companies produce oils graded as follows:

Light.
Medium.
Heavy.
Extra heavy.

Whereas most automobile engines will thrive on light oil, truck engines require medium and tractor engines require medium-heavy and extra-heavy. Truck engines run well in winter on light oil and operate best in summer on medium. Some tractor engines operate in winter, spring and fall on medium and in summer, heavy oil. These are the smaller tractor engines which do not have the piston clearance nor do they get as hot generally as the large engines which operate in winter, early fall and late spring on medium and summers on heavy or even extra-heavy.

In burning gasoline, engines do not usually get as hot as when burning distillate or kerosene. If an engine operates well at any one season on one grade or weight of oil while burning gasoline, it will operate better with a heavier oil burning kerosene. Full force-feed systems can use heavier grades of oils than splash systems.

There is still another reason for heavier grades of oils in tractor service or when burning kerosene which has been mentioned before under crankshaft specifications, namely the dilution of the crankcase oil due to loss of mixture past the rings. Two days' service using the same lubricating oil while burning either gasoline or kerosene will result in heavy dilution of the crankcase oil.

One instance comes to the writer's mind in which, after a day's run, there was a greater quantity of oil and kerosene in the case at the end of the day than in the morning. In gasoline engines the gasoline evaporates under the best conditions of operation, while kerosene remains. Ten days' service with kerosene without complete change of oil will bring the power of an engine down 20 per cent. In hot weather, the drop will be greater. Frequent renewal of oil or boiling off the lighter constituents before mixing with other oil helps considerably.

### Fuel

The most serious problem at this time is the matter of fuel for truck and tractor engines.

The problem of burning so-called gasolines now sold is becoming very serious and the further the situation develops the greater necessity there is for starting on one fuel and running on another. This leads to the question of burning straight kerosene.

The writer has produced and put in service engines of the regular truck type for burning kerosene in tractor work, and probably has out 2600 kerosene-burning engines, some having run for 3 years. The following conclusions regarding kerosene burning can be drawn:

(1) In tractor service where the load range is within 50 per cent of full load, kerosene can be used with reasonable satisfaction by the use of properly proportioned combined intake and exhaust manifold, the starting to be made on gasoline.

(2) Under these conditions the loss in volumetric efficiency due to heating the intake charge results usually in a loss of 10 to 20 per cent in the maximum horsepower output, whether gasoline or kerosene is used.

(3) Where speed of engine increases, the necessity for heat in the intake decreases, while when speed decreases necessary heat in intake increases. At full speed and power output, very slight heating of intake will suffice.

(4) Trucks can be made to operate on kerosene by the means mentioned above. One truck has operated one season in a pea harvest on 6.4 gallons per mile on a 2-ton truck equipped with a 3¾ by 5¾ engine. On the same job with conditions as nearly identical as possible and in the same service, the truck made 7.75 gal. per mile on kerosene. On a run of 50 miles the same truck made 10 miles per gallon over city and country roads with gasoline while on kerosene it made 15.25 miles, both figures being for truck running half the distance with pay load and return empty. These figures were made in an attempt to produce the best performance and all figures are given to encourage the hope of progress along this line. The design and applications which were responsible for this performance are being put in commercial shape.

(5) The science and art of burning kerosene as indicated by experience and the results obtained in service are identical with the principles set forth in several papers by Prof. Lucke, and the writer takes pleasure in testifying to the correctness of both the scientific and practical conclusions contained in his papers.

(6) *Our experience is that a kerosene engine does not carbon any more than a gasoline;* in fact, stays cleaner than a gasoline engine if vaporization is only comparatively well done.

(7) Where kerosene is well vaporized so that the mixture reaching the cylinder is in a dry state, a kerosene engine with a correctly designed combustion chamber will not heat as much as a gasoline engine.

(8) Experience as to the function of various elements in burning any or all grades of fuel is expressed as follows:

The carbureter meters and atomizes the fuel.
The manifold must vaporize the mixture.
The combustion chamber burns it.

It will save many inventors much disappointment to know that of all the things mentioned above the carbureter is the most perfect for the work they have to do.

The manifolds are next in efficiency.

The engines in their present form are furthest from being able to perform their functions in attempting to burn kerosene.

*The development of kerosene burning in engines of the prevalent types must start with the engine and end with the carbureter.*

### Application of Tractor Engines

While a definite knowledge of transmission and tractive resistance losses are necessary in order to make a rational design, engines are generally applied based on broad considerations. The average light tractor will show a draw-bar horsepower of 60 per cent of the brake horsepower of the engine. A poor tractor and design will deliver only 50 per cent, while the best never exceeds 70 per cent, and this figure is doubled by good authorities. The above performances are based on the tractor operating on good solid dirt footing.

Plows require a draw-bar pull from 300 lb. apiece to 1200 lb. This is for a 14-in. mold-board plow cutting 14 in. wide and 8 in. deep. An average would be 600 lb. per plow. The average day-in and day-out plowing is done at 2¼ m.p.h., which is practically 200 ft. per min. If, therefore, we solve for horsepower necessary to get

$$\text{Hp.} = \frac{600 \times 200}{33{,}000} = 3.6 \text{ Hp.} \qquad (8)$$

$$\text{or } \frac{3.6 \times 100}{60} = 6 \text{ brake Hp. average.} \qquad (9)$$

For average service it requires 6 brake hp. per plow or 1 hp. for every 100-lb. draw-bar pull at 2¼ m.p.h. Using the figures as given above, it will be easily seen that the maximum requires just twice the average and the minimum, one-half the average. Twelve brake hp. per plow for maximum plowing conditions would therefore be correct. A great many tractors are based on these figures, which are considered conservative. The most efficient tractor in the writer's

experience allows only 6 brake hp. per plow but can handle only 800 lb. draw-bar pull or 4800 lb. for six plows at 1.7 m.p.h. Where this tractor is operated in 1200 lb. soil, it immediately plows very shallow or drops down to four plows.

Allowing a brake M. E. P. of 85 lb. per sq. in. as a working pressure and a piston speed of 1000 ft. per min. as a high working average, and figuring a tractor speed of 200 ft. per min. we then have a ratio of 5-1 for piston speed to tractor speed and our equation for draw-bar pull figured from the bore would be as follows:

$$D.B. = \frac{0.7852\ B^2 \times M.E.P.\ Ps \times E}{100\ Ts} \qquad (10)$$

In which D.B. = Tractor draw-bar pull.
M.E.P. = Average working pressure on piston.
B = Bore of engine in inches.
Ps = Piston speed.
$E = \frac{\text{Tractive Hp.}}{\text{Brake Hp.}}$
Ts = Tractor speed in ft. per min.

This formula points out the desirability of high working pressure in the cylinder, higher piston speeds and the influence of tractor efficiency and design on the size of the engine. It also calls strong attention to the fact that the high tractor speeds mean great cylinder size.

Inserting in equation (10) the various values ascribed above we simply with E = 70 per cent to

$$B = \sqrt{\frac{D.B.}{234}} \qquad (11)$$

and with an efficiency of 60 per cent

$$B^2 = \sqrt{\frac{D.B.}{194}} \qquad (12)$$

We have seen that it requires 1200 lb. maximum draw-bar pull efficiency and design on the size of the engine. It also calls strong attention for each plow. If we desire to know the bore of a four-cylinder engine necessary to pull the plows under the average conditions at 2¼ m.p.h., we substitute the 1200 lb. value in the equation (11) as follows:

$$B = \sqrt{\frac{3600}{234}} = 3.9$$

with an efficiency of 60 per cent

$$B = \sqrt{\frac{3600}{194}} = 4.3$$

The most frequently used engine for a three-plow tractor has a 4.25-in. bore. Tractor engine speeds have been determined mostly by what experience has shown to give endurance. Investigation has proven that the bore seems to have quite an influence on speeds, as well as the development of the art. The following formula expresses the speed of tractor engines in terms of the bore:

$$S = \sqrt{\frac{3{,}000{,}000}{0.04545\ B^3}} \qquad (13)$$

In which S = Revolutions per minute.
3,000,000 = A variable depending on manufacturer or development of the art.
0.04545 = Constant.
B = Bore in inches.

The formula holds good for 3¼-in. bore to the very largest sizes, even 9-in.

It is obvious that the factor 3,000,000 cannot hold for all engines of any manufacture, but it gives merely an average.

### Life of Engine Parts

The piston speed of 1000 ft. per min. is higher than the old line manufacturers use, their practice being to limit piston speed to 800 ft. per min. While this most certainly results in longer life it is doubtful if this low figure is necessary with the efficient engines of to-day. The piston speed does not in itself determine the life of the engine parts. The engine endurance is more dependent on the square of the r.p.m., weight of reciprocating parts and above all on the efficiency of cooling and lubrication.

### Tractor Applicable to Stationary Work

Engines on tractors are used for stationary work, such as running a grain separator, etc. The following formula is derived from service conditions:

$$D = 17\ C \qquad (14)$$

in which D = Displacement of the engine in cubic inches.
C = Size of cylinder on separator.

This assumes power feeds and wind stacker, or what is known as modern attachments on the separator.

### General Conclusions

Within the scope of a paper it would be impossible to go very deeply into the science of internal combustion engineering. What has been written has been merely the attempts to answer in a general way the common daily questions that an engineer is called on to answer.

The writer has come to look on the building of engines from the following standpoints:

1—To generate quickly and to utilize all the heat that is possible to produce power.
2—To eliminate the greater part of the heat so as not to interfere with practical working conditions of the structures.
3—To maintain lubrication, an art not generally understood, the development of which is but beginning, and yet the art that makes engines possible.
4—To produce an engine which will not tear itself to pieces, or, in other words, will endure its own stresses, both dynamic and thermal.
5—To make such liberal allowances in design that engines will operate in spite of their neglected upkeep.
6—To get more out of given displacement by increasing the working mean effective pressure and to improve the details, so higher engine speeds can be used without reducing the life of a motor or satisfactory service.

This constitutes ideal progress and is the only way progress can be made.

## Temperature Control Will Be Elaborate

(*Continued from page* 479)

| Temperature | Expansion |
|---|---|
| 150 deg. | 0.161 in. |
| 160 deg. | 0.202 in. |
| 170 deg. | 0.250 in. |
| 175 deg. | 0.250 in. |
| 200 deg. | 0.254 in. |

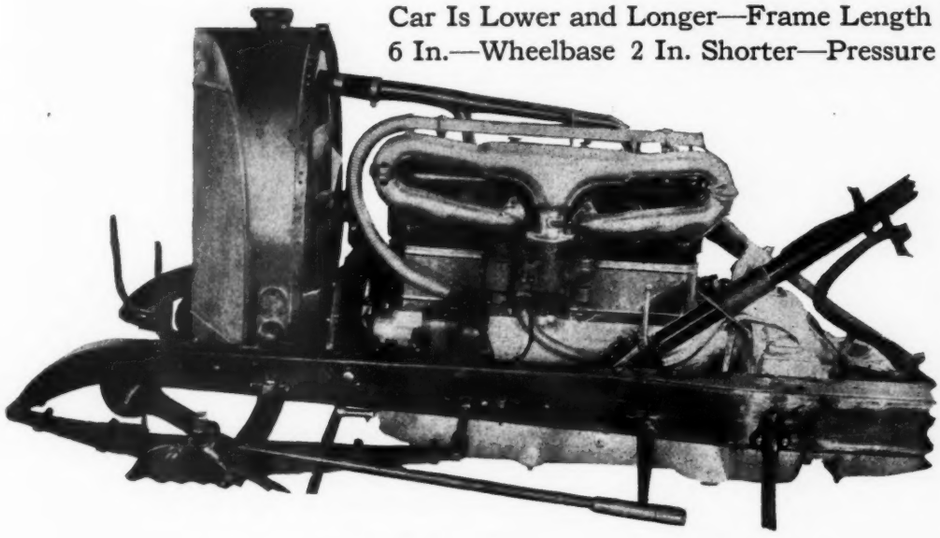
He said that he had tried running at boiling point and found the revolutions increased 150 per minute, while the power went up also, but piston expansion caused a drop again after a short period of running. Regarding the mechanical power of the thermostat unit it was as follows:

| Temperature | Pressure Exerted, lb. |
|---|---|
| 70 deg. | Closed |
| 90 deg. | 1 |
| 110 deg. | 2.5 |
| 130 deg. | 3.5 |
| 170 deg. | 9.5 |
| 190 deg. | 14.5 |
| 190 deg. | 21.0 |

Concerning the effect of the thermostat he tried taking a car from a room at 60 deg. and starting out in weather 8 deg. above. With the thermostat the carbureter was operating properly after 2.9 miles running with the water temperature in the jackets at 110. The same experiment was made without the thermostat and the carbureter was still popping back and misbehaving after 12 miles running.

# Aluminum Alloy Pistons in Singer

## Car Is Lower and Longer—Frame Length Increased 6 In.—Wheelbase 2 In. Shorter—Pressure Oil Feed



Intake side of the 4 by 5½-in. six-cylinder engine used in the new Singer

ALUMINUM alloy pistons are the most important innovation on the Singer six for 1917. This car, which sells for $3,500, is entering its third year of production with very few changes of a fundamental nature. There are, however, a number of detail improvements which have rendered the car, as a whole, lower, of slightly better characteristics at high speed, and more nearly perfect in suspension and control.

### Car Is Longer and Lower

Magnalite has been selected as the material to supplant the cast-iron formerly used in the pistons. The only other engine change is in the oiling system, which heretofore has fed lubricant to the connecting-rod bearings by splash. In the new cars pressure feed, acting at 30 lb. per sq. in., sends the oil positively to the required spots. This has, of course, necessitated a new oil pump.

Structurally, the Singer car is longer and lower, although the wheelbase is shorter. This condition is obtained by an increase in the length of the frame of 6 in. The wheelbase is now 136 in., however, instead of 138 in., giving a greater over-all length on a shorter supporting span. The prime reason for the change in frame length is in a new type of gasoline tank which, instead of being cylindrical, is now of rectangular section. The cylindrical tank was used because it conformed to the turned-over frame-ends which formed the rear tire support. Since a spindle is now being mounted to carry two extra wire wheels, it is not necessary now to curve the frame over, and hence the new form of tank and longer frame.

This increase in frame length has effects which are not confined to the gasoline tank, in that more room has been secured in the body because of the extra supporting surface which is now possible beneath the sills. Not only is the body more roomy in a lengthwise direction, but the rear seat is also wider, having been increased from 45 in. to 47 in. The body is more comfortable also because of deeper upholstery, which is now 10 in., and, instead of tufting, French plating is used in its place. As far as decoration and conveniences go, the body is improved, particularly in the fitting of a mahogany case in the rear cowl behind the front seats.

Throughout the chassis there are several spots which have been improved in detail. The rear springs, for instance, are now flatter under load than they were formerly. In fact, with a fully loaded car springs should be horizontal, and the feature of this which is important to the driver is that the radius of oscillation of the spring is such that the results on the brake linkage are at a minimum; that is, there is no tendency to bind the brakes owing to spring oscillation because of the minimum projected length of the spring variation. The flatter springs, combined with lower bodies, make the entire car 3 in. lower than it was a year ago.

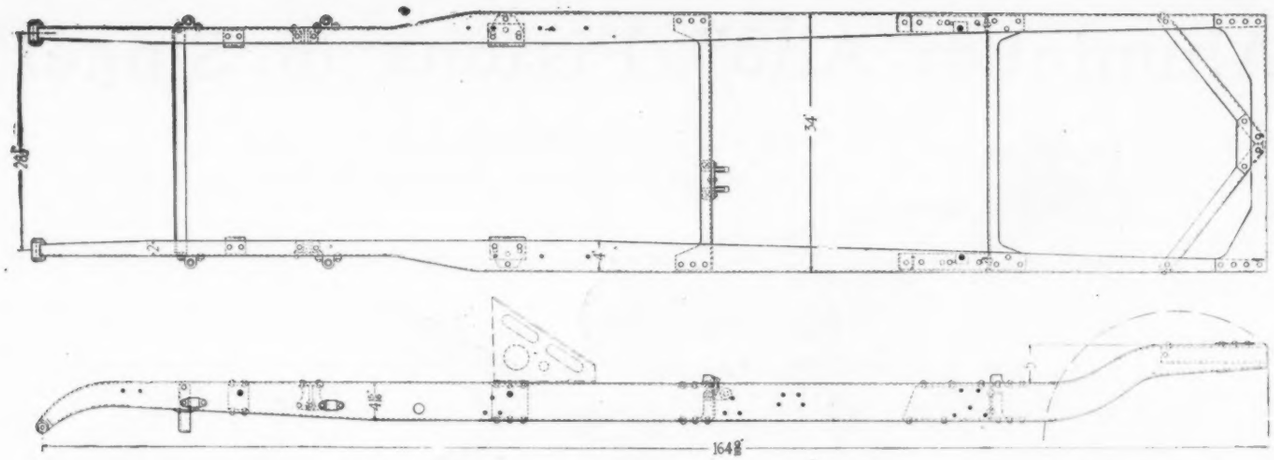
### Front Spring Mounting Changed

In the front springs there has been an alteration in mounting. These are parallel to the center line of the car, but are tilted in their own vertical planes so that the forward end of the spring is lower than the rear. This has been done owing to the belief of the engineering department that the shocks are better absorbed in this way. The front spring horn has been made steadier and of greater bearing space to compensate for this change. In addition, the Timken axle, which is used in front, is now the heavy-duty design with full bearing support.

While the torque rod made up of welded Shelby tubing with cross members forming virtual webs is still employed, it is 8 in. shorter. This change has been accomplished by moving the front cross member which carries the support for the forward termination of the torque arm, back a corresponding distance. The result is that owing to the decreased length the torque rod is more rigid. Another change in the rear linkage is in the braking system which used to run continuously from the

**Features of Singer Six**

| | |
|---|---|
| Engine | Six-Cylinder |
| Bore and Stroke | 4 by 5½ in. |
| Formula Hp. | 50 |
| Oil Feed | Pressure |
| Clutch | Dry Plate |
| Gearset | Four-Speed |
| Wheelbase | 136 in. |
| Electric System | Westinghouse |
| Upholstery | 10 in. |



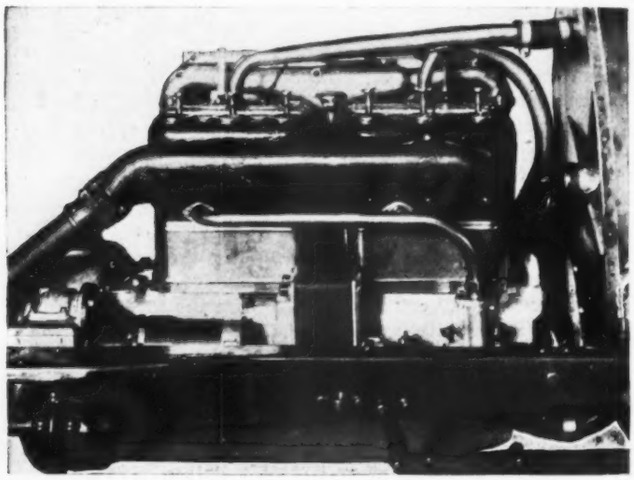
The Singer frame layout is very rigid, the 5-in. channels being well provided with cross members which stiffen it against racking stresses

operating levers back to the brakes. It has now been broken in two, giving a double reduction.

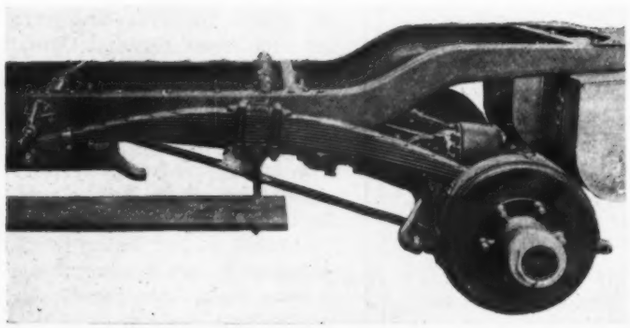
### Clutch Easy to Operate

As regards control, the changes are only in detail. There is a longer clutch pedal which has increased the leverage to such an extent that a person standing beside the chassis has no trouble in disengaging the clutch with the hand. The steering gear has been changed and is now a Gemmer.

Fitted to the engine there are three attachments which are innovations for the 1917 model. These are a Rayfield carbureter, a Klaxon horn and a four-bladed cast aluminum fan.



Exhaust side of the engine used in the Singer six chassis



Cantilever rear spring on Singer chassis. This is flatter under load than previous models, making riding easier and also aiding in giving the car a low appearance

The carbureter formerly used was abandoned owing to its difficulty of adjustment, and the simpler Rayfield substituted. As with the other type, this is distinguished by its full hot-water and hot-air vaporizing means.

The Singer power plant is made up of a specially-built Herschell-Spillman engine, a dry plate clutch and a four-speed gearset with direct drive on fourth. While the engine is rated at 50 hp., it has developed in excess of 100 hp. at more than 2000 r. p. m., and with the aluminum alloy pistons there has been an increase in power output due to a higher maximum speed. Probably the most notable point of the power plant is the unique system of manifolding. It is to this that a large part of the power and flexibility is credited. The intake manifold has a sort of ram's horn effect, taking the gases from the carbureter, carrying them upward to the branches of a Y-shaped water-jacketed pipe, from where each branch divides into a loop to the three cylinders. This is clearly shown in the accompanying illustration of the intake side of the engine. While this manifold seems long, it will be noted that throughout a large part of its length it is heated, and, furthermore, it is of large diameter and has no sharp turns. It is stated that a marked gain in volumetric efficiency has been obtained due to this intake system.

### Dual Exhaust Manifold

On the exhaust side there is a dual manifold in which each set of three cylinders is taken care of independently, thus avoiding conflicting or overlapping exhaust. The manifold itself is in one piece, but there is a wall between, which separates the flow from each block of three cylinders. The timing is arranged so that the exhaust of two cylinders are never open at the same time.

The engine dimensions are 4 by 5½. The cylinders are T-head, cast in threes, with integral waterjacket spaces closed by caps on the top. The manifolds are separate. The aluminum alloy pistons deliver the power to I-beam connecting-rods of forged steel. Both sets of valves are thoroughly inclosed, giving a clean exterior. The carbureter and magneto are mounted on the left, the latter being a Bosch high-tension instrument with the wire leads carried in conduits to the spark plugs. On the right side is mounted the electric generator and water pump, and also the starting motor. The generator and pump are carried on the same shaft, while the starting motor engages with the flywheel at the rear right of the engine.

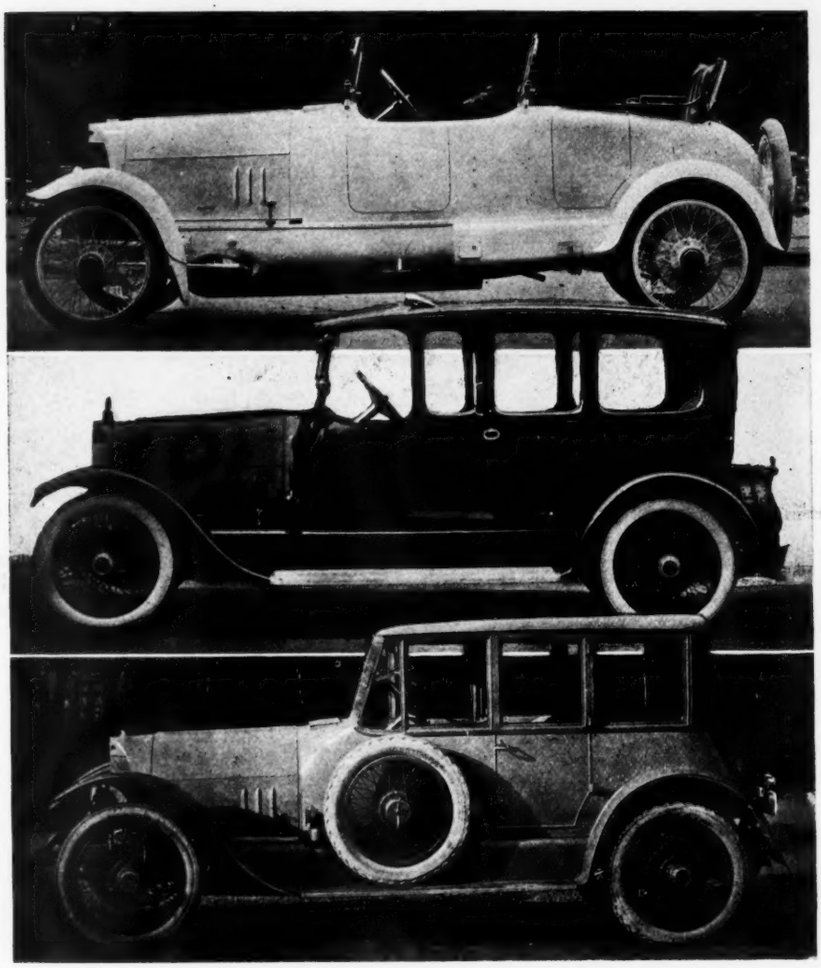
Besides the ignition system, the remainder of the electrical equipment is Westinghouse. There is a two-unit starting and lighting system operated on the single-wire system, and the storage battery is a Willard.

In the new oiling system the gear pump is driven off the

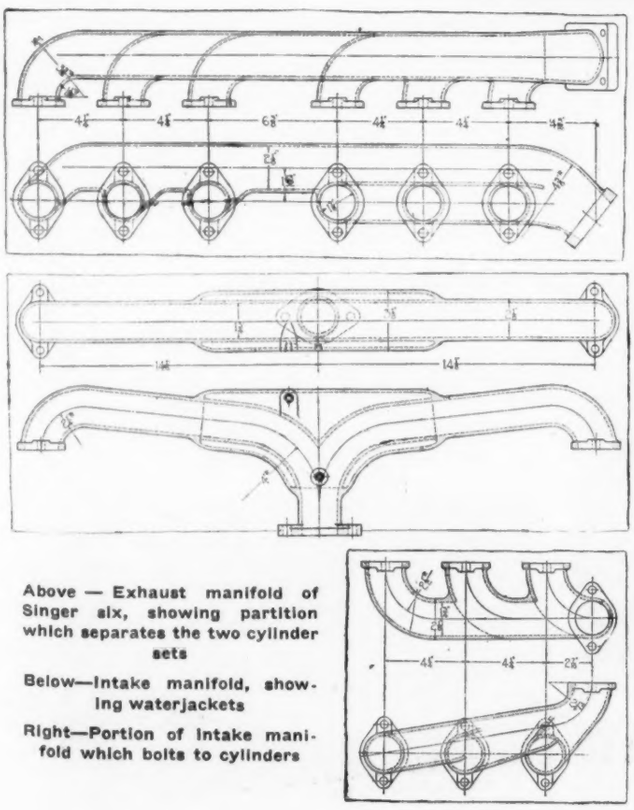
camshaft, and the oil reservoir is in the bottom of the crankcase. The oil is fed under pressure to the main bearings and through the hollow crankshaft to the remaining bearings under pressure. Under ordinary running the oil feed is up to 30 lb. per sq. in., but this will vary according to the work performed by the engine. The oil is recirculated and screened on its course through the lubricating system.

Power is transmitted from the motor to the gearset through a dry plate clutch consisting of steel disks faced with fiber. The clutch is held engaged by a double concentric helical spring, and although this spring is of sufficient strength to hold the car and to guard against slippage on acceleration, the disengagement can be affected by remarkably light pressure on the clutch pedal. This clutch is in a unit with the four-speed gearbox, which is featured by the mounting of the shafting on Timken roller bearings. The shifter mechanism is conventional with the lever mounted on the cover of the gearbox and operating on a ball joint.

Two Spicer universals are used in delivering the car to the rear axle, which is a Timken floating design. The drive is taken through the cantilever rear springs, but the torque is taken care of by a special member assembled and welded together in the triangular form of Shelby steel tubing. The rear axle gears are spiral bevel and provide a ratio on fourth speed or direct of 3½ to 1. The wheels are Houk wire and carry 35 by 5 in. tires, which have been continued owing to the remarkably good mileage experienced with this size.



Illustrating some of the body styles mounted on the Singer chassis



Above — Exhaust manifold of Singer six, showing partition which separates the two cylinder sets

Below—Intake manifold, showing waterjackets

Right—Portion of intake manifold which bolts to cylinders

One of the noteworthy features of the Singer construction is in the rigidity of its frame layout. As is conventional practice, the individual members are of channel section with a 5-in. depth of web and 4-in. flanges. The frame is amply provided with cross members, which stiffen it against racking stresses. The cross members are fitted with large gusset plates which give them a capability of withstanding distorting tendencies.

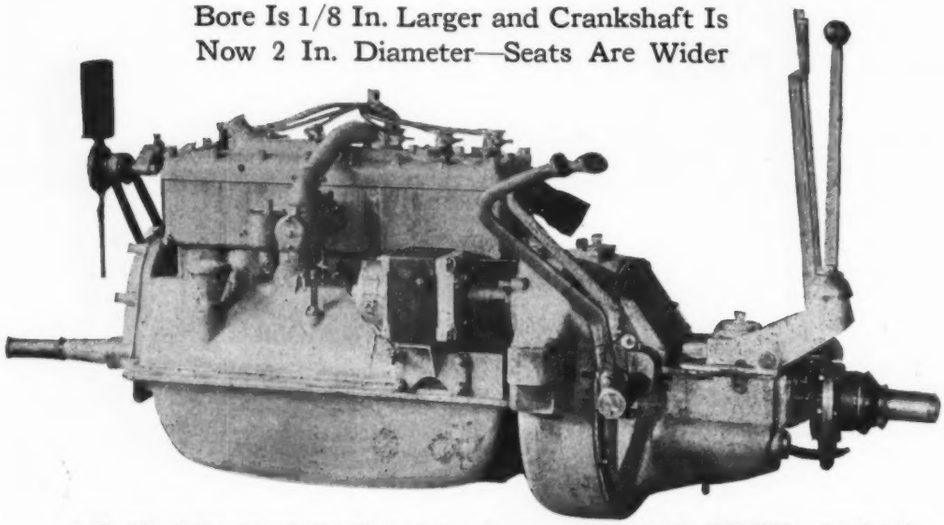
As would naturally be expected with a chassis of this price, the equipment is of the best. The radiator is a V-shape of exceptional size and capacity, and throughout the actual fittings are large and sturdy. The top is a one-man design provided with Jiffy side curtains, and connects with a special built-in ventilating windshield. The car also has a Warner 100-mile speedometer fitted with an electric light, Klaxon horn, 8-day keyless clock, electric trouble lamp with extension cord, tools, jack, power-driven tire pump, etc.

### Standard Bodies Made

While the major percentage of bodies for the Singer cars are custom built, the concern is marketing standard roadster, touring and closed bodies. The standard touring design is a seven-passenger type with the Belgian double cowl. The extra seats fold into the backs of the front seats, and above them is located the mahogany cabinet which is an innovation this season. This is made of inlaid wood and is ornamental as well as of practical utility. Any color that is desired will be given the body, so that the purchaser is allowed a very wide latitude in making his selection. The chassis alone sells for $3,000.

# New Glide Roomier and More Powerful

## Bore Is 1/8 In. Larger and Crankshaft Is Now 2 In. Diameter—Seats Are Wider



Left side of the six-cylinder 3⅛ by 5-in. power plant used in the 1917 Glide, showing the mounting of the carbureter and the starting motor

NO changes of any consequence have been made in the Glide line for 1917. The light 6-40 car is continued with refinements and no additions have been made by the manufacturer, the Bartholomew Co., Peoria, Ill. In general, the changes which have been made in the car are such as to render it more powerful, more roomy and to increase the factor of safety. There have also been a few alterations which would tend toward making the car more nearly silent.

Probably the most notable change is in the engine where the bore has been increased from 3 to 3⅛ in. Another change in the engine is in the crankshaft which has been rendered more rigid by increasing the diameter to 2 in. instead of 1¾ in. Another change in the engine which would tend to make it noiseless is in the use of a Fabroil gear on the end of the camshaft.

While the mechanical changes noted have the most to do with the performance of the car it is also altered to some degree in appearance. One of the improvements is in the rounded cowl which takes away the square effect at the windshield and the latter is especially built to conform with the rounded shape of the cowl and fits exactly to its curvature.

As far as comfort features are concerned a conspicuous feature is the width of the rear seat which is now 47 in. and will accommodate three adults very comfortably. The springs have been lengthened both front and rear giving an easier suspension, the dimensions being now 38 and 54 in. respectively. In general, all the parts and accessory equipment made by specialists have been retained. This includes Westinghouse lighting and starting, Rayfield carbureter, Brown-Lipe three-speed gearset, Spicer universals, etc.

While only one chassis model is marketed the body line is quite complete as the car will be furnished in the regular touring models and with a detachable sedan top if desired. There is also a four-passenger close-coupled roadster in the process of production in which particular attention is stated by the makers to have been paid to the comfort of the occupants of the rear compartment. For instance, by a special arrangement of the footboard in the rear, the passengers have as much room with their feet as those in the front.

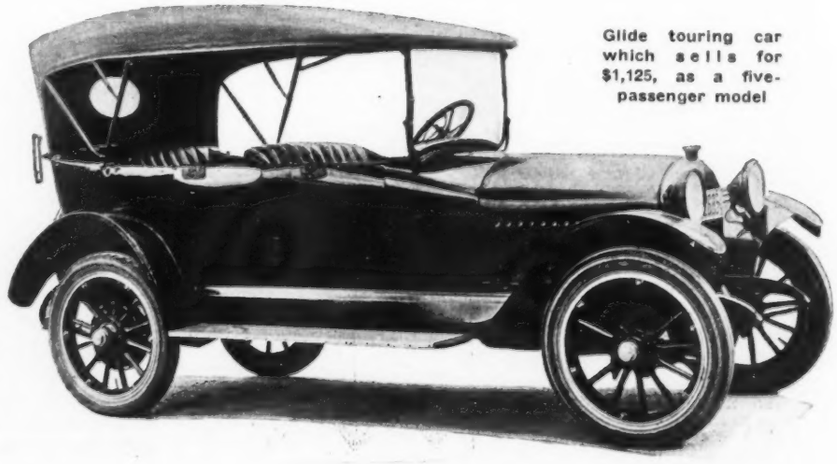
All the improvements in the body can really be summed up in the words, increased roominess. The 47-in. seat is 5 in. wider than in the 1916 car. The front seat is 1½ in. wider than previously. The windshield is 1¼ in. wider and 1½ in. higher besides the alteration in curving it to conform to the shape of the cowl. The top is also new, being a five-bow design with bare top holders and having the rear curtain fitted around the corners of the body to exclude dust. It is fastened to the back of the body by German silver molding.

A unit power plant is employed having block cylinders and three-point suspension. The six cylinders have a bore of 3⅛ and a stroke of 5 in. and are of L-head form with the valves on the right. This is a Rutenber product designed particularly for the Bartholomew company, and is known as model 25.

### Three Piston Rings

The pistons are cast iron and are fitted with three separate rings. Two of these are close to the top and the third just beneath the wristpin boss. The wristpin is secured in the boss by a set screw and engages through a bronze bushing with the drop-forged I-beam connecting-rod.

The 2-in. crankshaft is a forging, as is also the camshaft which has a diameter of 1⅛ in. with the cams integral. The shafts are hardened and ground and are carried on plain bearings at the center and front and in an S. K. F. double row self-aligning bearing at the rear. Mushroom type flat

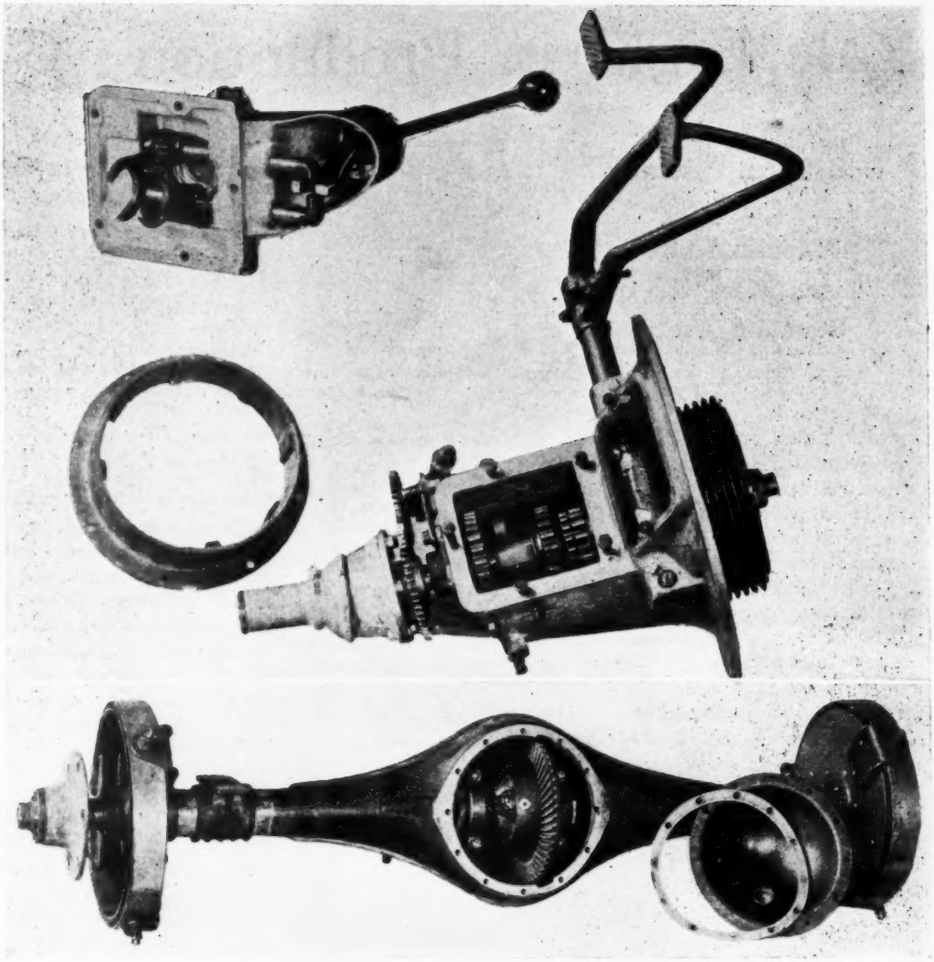


Glide touring car which sells for $1,125, as a five-passenger model

followers take the valve drive. These are offset 1/16 in. to distribute the wear. The valves are made in two parts with alloy steel stems and carbon steel heads. The diameter in the clear is 1 5/16 in. and the lift is 5/16. One of the features of the valve construction is that the brackets, together with the entire lifter mechanism, can be taken from the engine without disturbing the camshaft. This is done by removing the cover plate and stud nuts and then turning the starting crank until the valves are at their lowest level.

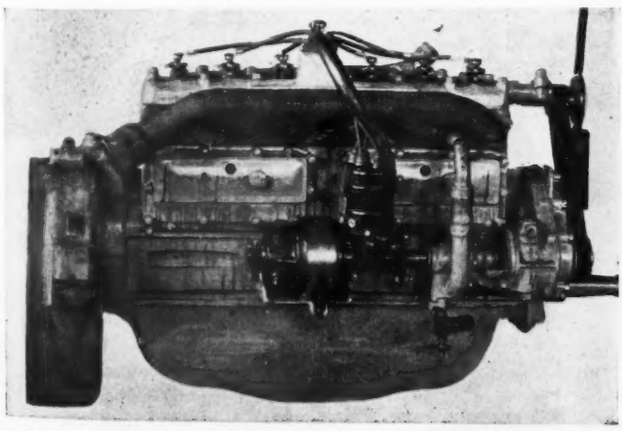
Standard timing is used with the intake valve opening at 15 deg. after top center and closing 50 deg. before bottom center. The exhaust valve opens 45 deg. before bottom center and closes 10 deg. after top center. The compression of the engine is 75 lb. absolute.

Lubrication is by accommodation pressure and splash feed with a 1½ gal. reservoir in the bottom pan. From this the oil is drawn by a plunger pump which is driven by an eccentric off the camshaft. There are direct leads from the pump to the main bearings which thus receive a supply of oil under pressure. The other leads go direct to the crankcase where the oil is led to splash troughs placed beneath each connecting-rod throw. Provision is made for the mounting of an oil pressure gage and this may be regulated by an adjustable relief valve.



Details of the three-speed gearset and floating axle used in the 1917 Glide

Complete Westinghouse equipment is used throughout, even to the fitting of an ammeter and voltage regulator. It is a two-unit layout with a reversible switch which alters the direction of current flow automatically so that the contact points of the breaker box are prevented from pitting. For engagement with the flywheel a Bendix gear is used. The battery is a Willard of 80 amp. hr. capacity. Two sets of bulbs are provided in the headlights and there is also a dash light which can be employed as a portable lamp by means of a 12-ft. extension cord.



Right side of Glide six engine, showing the generator and ignition distributer mounting

Gasoline is fed by means of the Stewart-Warner vacuum system which is mounted beneath the hood and operates in connection with a 16-gal. tank at the rear of the frame. Carbureter is a Rayfield and is provided with an efficient choking device which renders it unnecessary to prime the engine through the petcocks even in the coldest weather.

From the engine the power is taken by a dry multiple disk clutch having twelve steel plates. Six of these are faced with Raybestos. The selective gearbox is Brown-Lipe, mounted in an aluminum case, to cut down weight. From this the drive passes through a Spicer universal joint which is dustproof and self-lubricating. The propeller shaft is hollow, having a tubular section and taking the drive directly to the pinion shaft upon which is mounted the spiral bevel pinion. This transmits the power to the floating axle shafts through the Brown-Lipe differential. Two sets of brakes with 14-in. drums having a face width of 2 in. are bolted to the rear wheels. Wheelbase is 119 in.

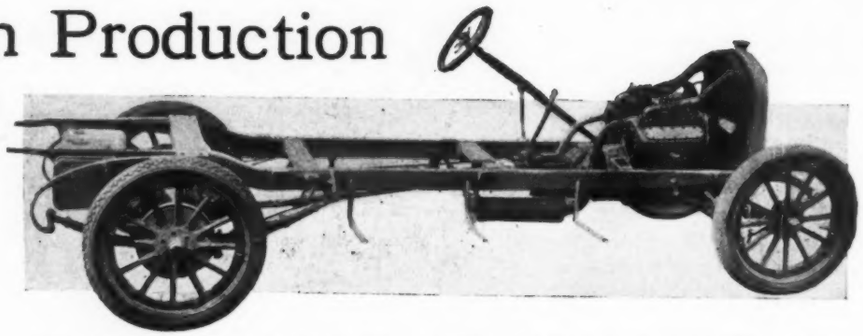
### Hotchkiss Drive Used

Hotchkiss drive is used as both the propulsion and torque strains are absorbed in the springs. This is in conformity with the policy to be noted throughout in keeping the car as light as possible. The tire sizes are 34 by 4.

At the price, $1,125, full equipment is included. The price mentioned is for the five-passenger body. A detachable sedan top can be had for $200 additional.

# Yale Eight in Production

## New Seven-Passenger Car Is Mounted on Chassis Made Up of Standard Units



Chassis of the Yale eight, showing three-quarter elliptic type of rear springs, fuel tank mounting and installation of unit power plant in the frame

THE Yale Eight, which is produced by the Saginaw Motor Car Co., Saginaw, Mich., is characterized by the use of standardized products throughout. For the present it will be supplied only in seven-passenger form at $1,350, though the addition of a Winter top is contemplated. The standard color is ivory white for the body with black fenders and trim. Yale blue and black is an optional finish furnished without extra cost.

The engine used in the new car is built by the Saginaw company and adheres to standard practice in design, having its 3⅛ by 4½-in. L-head cylinders cast in two blocks of four each. Formula horsepower is 31.25. The carbureter is a Rayfield. The Remy ignition unit is acessibly mounted directly at the front of the V. The electric lighting and starting system is a two-unit outfit and the battery is a Willard.

### Thermo-Syphon Cooling

Lubrication is primarily by force feed with auxiliary oiling by splash. Cooling is by thermo-syphon. The clutch is a multiple disk type transmitting power through a Muncie three-speed selective gearset in unit with the motor. Hotchkiss drive is a feature.

The chassis has a 126-in. wheelbase and 34 by 4-in. tires are used, with non-skid in the rear. Axles are Timken and steering is Lavine.

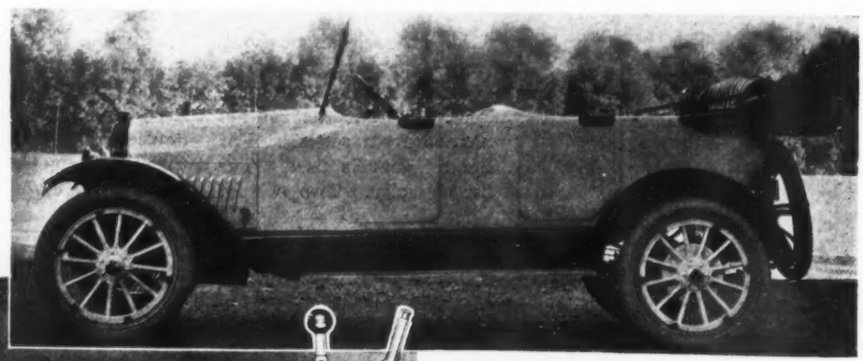
### Wind Resistance Minimized

The attempt to reduce wind resistance to the minimum is apparent in the body design. The hood is tapered to blend well with the rather deep cowl and the sides are perfectly smooth. The windshield is smartly raked. There is a cowl at the back of the driver's seat which serves to house the auxiliary seats. All doors are fitted with pockets. The upholstery is leather and the backs of the seats have been moulded to fit the backs of the occupants.

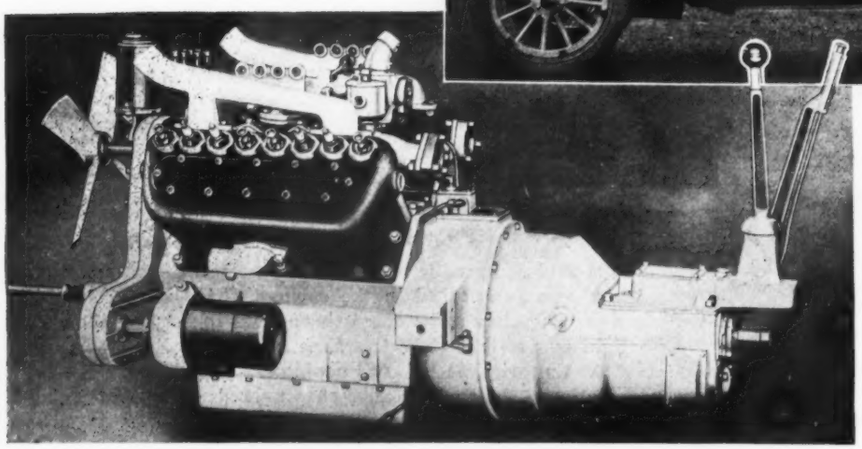
### Comfort an Aim

Great care has been taken to insure excellent riding qualities, and to this end the weight has been proportioned over front and rear axles only after long experiment. The spring suspension is normal in front, but in the rear there is modification of the three-quarter elliptic idea, which, however, does not appear unusual. The springs are 56 in. long.

The Saginaw Motor Car Co. has recently purchased the plant of the American Electric Wheel Co., which will be used to facilitate production. The E. B. Sutton Sales Co. has taken over the entire distribution of the Saginaw company. Headquarters have been established at the factory.



The eight-cylinder, seven-passenger Yale touring car which is now going through production. It has a 126-in. wheelbase, three-speed selective gearset and uses 34 by 4-in. tires. Cooling is by thermo-syphon and Hotchkiss drive is a feature. With complete equipment the car sells for $1,350



Yale eight-cylinder unit power plant. It has a bore of 3⅛ in. and a stroke of 4½, the formula horsepower rating being 31.25. The generator mounting is shown, carbureter and ignition units being carried in the V between the cylinder blocks

# Burford Truck in 2 and 4-Ton Models

## Internal Gear Drive Used on Smaller and Worm Replaces Chain on Larger of New Vehicles

TWO models, a 2-ton and a 4-ton, will compose the line of the Burford Motor Truck Co., Fremont, Ohio, for 1917. The internal-gear drive is used on the smaller chassis and a worm axle on the larger, the former being a continuation of last year's practice and the latter a change from the chain drive employed previously.

### Engines Are Similar

The engines used are similar on both models, though different in size and in the fact that the smaller has block cylinders while the larger has pair castings. Dimensions are 3¾ by 5½ in. for the 2-ton and 4½ by 6¾ in. for the larger model.

Lubrication has been cared for particularly, oil being forced to the main crankshaft bearings by a plunger pump, and also supplied to dip troughs for the connecting- rods. Oil pump and strainer gauze are both very easily removable.

On the side of the cylinders remote from the camshaft there is a front end gear which drives the water pump, and the Eisemann magneto is coupled to the water pump shaft by a universal joint. The pulley for the fan belt is set on the same line, just in front of the water pump, keeping the belt high up and so well protected from the destructive action of oil and water.

### Difference in Gearsets

On the 2-ton model the flywheel is contained in a bell housing which incloses the leather-faced cone clutch and supports the three-speed gearset, but the 4-ton type has a separate gearbox mounted independently and giving four speeds. This large gearset is of rugged construction, having gears 1½ in. wide with a 5-7 pitch, which makes for great tooth strength. Driveshafts and transmission gears are all chrome-nickel steel.

Strength in frame and springs is obtained by the use of high-quality steel and ample proportions. Radius rods are employed on the 4-ton model, but the smaller truck has Hotchkiss drive, the springs taking both torque and load. There is plenty of load space, the 2-ton being obtainable with either 132-in. or 144-in. wheelbase, and the 4-ton with a wheelbase of 175 in. Throughout both chassis a number of New Departure ball and Bower roller bearings are used.

### Brakes Differ

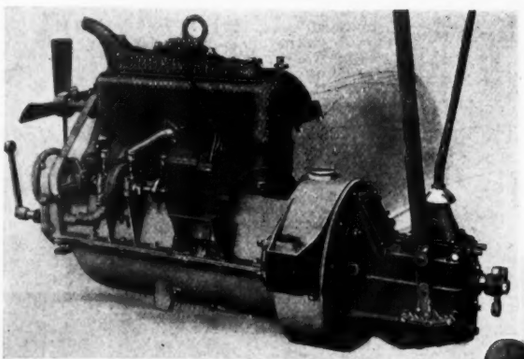
There is a little difference in the brake equipment, the smaller having the conventional expanding brakes in the wheel drums, but the emergency brake acts on a drum attached to the bevel pinion shaft. This axle is made in the Burford plant. The 4-ton has a Sheldon axle, and uses Sheldon double expanding brakes.

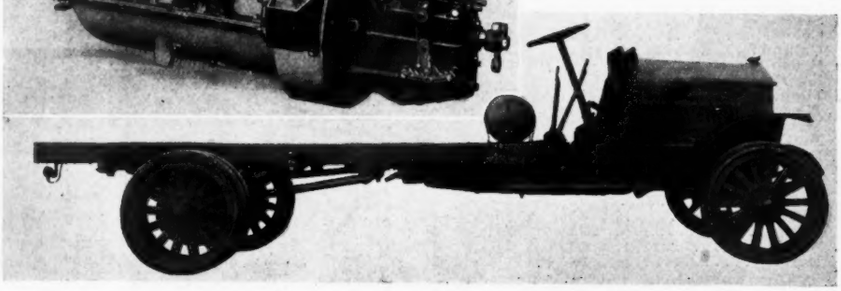
### Special Bodies Made

Tires are 36 by 3½ on the 2-ton, single in front and dual rear, while the 4-ton has 36 by 5 in., similarly disposed. The smaller chassis lists at $2,250 without body or cab, the latter costing $50 extra, and the 4-ton chassis sells for $3,600. Bodies of any kind can be supplied on special order. A fore-door cab can be supplied at an extra cost of $50.

Both models are electrically lighted, employing Willard storage batteries of the 6-volt, 80 amp.-hr. type. Each model also comes complete with horn, jack and tool kit.

The steering gears are of the conventional worm-and-nut type, with an 18-in. wheel on the 2-tonner and a 22-in. wheel on the 4-tonner. Right drive is adhered to in both models.



Upper — Two-ton Burford model with open body.

Left — Power plant of smaller model. Below — Side view of the 4-ton chassis, showing fuel tank mounting

# Colorado To Have 45,000 Cars

## Secretary of State Estimates Registration Increase of 50 Per Cent Before End of 1916—Over 200 Manufacturers Represented—Analysis by Makes

By H. G. Hedden

DENVER, COL., Sept. 16—Secretary of State Ramer estimates that automobile and motor truck registration in Colorado will pass the 45,000 mark before the close of the year 1916. During the first 6 months of the year 36,231 cars and trucks were recorded, representing the products of over 200 manufacturers. This is a gain of 14,405 cars or 66 per cent over the 21,826 registered during the same period in 1916. When the 45,000 mark is passed the increase over last year will be over 50 per cent. Mr. Ramer estimates that the 40,000 mark was passed early this month, which registration means one motor vehicle for every 20 of Colorado's 800,000 population. This estimate is based upon partial returns received for July and August, upon the calls from County clerks for more license tags and the continued heavy sales reported by State distributors of cars.

### $150,000 in Fees

Receipts from motor vehicle license fees in Colorado for 1916 will total between $150,000 and $175,000. No count has been made thus far, however, and the gain will depend upon the ratio of high-power cars. The license fees are $2.50, $5 and $10, for up to 20 hp., 21 to 40, and above 40, respectively. Inasmuch as the Fords, which pay only $2.50, represent 43 per cent of the total for the first half of this year, as against 34 per cent for the same period last year, it will be seen that the gain in receipts can hardly keep pace with the gain in number of cars registered.

The registration shows the following division of cars, according to class and horsepower:

| | Denver | Outside | Total |
|---|---|---|---|
| Gasoline passenger cars up to 25 hp | 4,912 | 15,762 | 20,674 |
| Gasoline passenger cars above 25 hp | 4,153 | 8,368 | 12,521 |
| Gasoline trucks | 440 | 181 | 621 |
| Electric passenger cars | 471 | 82 | 553 |
| Electric trucks | 67 | 6 | 73 |
| Stanley steamers | 65 | 75 | 140 |
| Dealers' cars, unclassified | 270 | 1,309 | 1,579 |
| San Miguel County, unclassified | ... | 70 | 70 |

This shows a comparative ratio of approximately 24 per cent for Denver and 76 per cent for the outside counties in the low-power class gasoline passenger cars, with 33 per cent for Denver and 67 per cent for the outside territory in the class above 25 hp.

### 15,727 Fords Registered

An analysis by make of all the registrations available to date in Colorado shows that there are 15,727 Fords on record,

## Analysis of Colorado Registrations By Make and Type

### GASOLINE PASSENGER CARS

| Make | Denver | Outside | Total |
|---|---|---|---|
| *Ford | 3,494 | 12,233 | 15,727 |
| *Overland | 659 | 2,267 | 2,926 |
| *Buick | 437 | 1,932 | 2,369 |
| *Studebaker, E. M. F. and Flanders | 477 | 1,373 | 1,850 |
| *Maxwell | 534 | 1,173 | 1,707 |
| Dodge | 239 | 783 | 1,022 |
| Cadillac | 354 | 492 | 847 |
| Chalmers | 248 | 406 | 654 |
| Chevrolet and Monroe | 162 | 404 | 566 |
| Reo | 130 | 430 | 560 |
| Metz | 148 | 307 | 455 |
| Hupmobile | 111 | 244 | 355 |
| Hudson | 143 | 184 | 327 |
| Saxon | 62 | 249 | 311 |
| Oakland | 57 | 227 | 284 |
| Franklin | 120 | 126 | 246 |
| Oldsmobile | 105 | 132 | 237 |
| Grant | 56 | 152 | 208 |
| Paige | 49 | 156 | 205 |
| Cartercar | 23 | 155 | 178 |
| *Packard | 99 | 77 | 176 |
| *Pierce | 116 | 46 | 162 |
| *Jeffery and Rambler. | 45 | 110 | 155 |
| Case | 23 | 114 | 134 |
| *Velie | 38 | 95 | 133 |
| Abbott | 60 | 72 | 132 |
| Mitchell | 58 | 74 | 132 |
| Haynes | 61 | 60 | 121 |
| Apperson | 50 | 64 | 114 |
| *††White | 36 | 66 | 102 |
| Dort | 11 | 89 | 100 |
| Inter-State | 50 | 50 | 100 |
| Regal | 22 | 77 | 99 |
| Chandler | 25 | 68 | 93 |
| Stevens-Duryea | 60 | 29 | 89 |
| Cole | 42 | 42 | 84 |
| Columbus | 71 | 17 | 88 |
| Brush | 18 | 63 | 81 |
| Everitt | 42 | 37 | 79 |
| Michigan | 15 | 55 | 70 |
| Kissel | 38 | 31 | 69 |
| Winton | 40 | 25 | 65 |
| Jackson | 23 | 39 | 62 |
| Briscoe | 14 | 45 | 59 |
| Moon | 12 | 44 | 56 |
| Peerless | 31 | 20 | 51 |
| National | 23 | 25 | 48 |
| Thomas | 31 | 16 | 47 |
| King | 21 | 24 | 45 |
| Krit | 13 | 27 | 40 |
| Dorris | 28 | 11 | 39 |
| Marion | 23 | 16 | 39 |
| R. C. H. | 17 | 21 | 38 |
| Pullman | 7 | 29 | 36 |
| Scripps-Booth | 16 | 18 | 34 |
| Detroiter | 11 | 21 | 32 |
| *Locomobile | 18 | 12 | 30 |
| Stoddard-Dayton | 29 | 1 | 30 |
| Pathfinder | 13 | 15 | 28 |
| Empire | 10 | 16 | 26 |
| Imperial | 4 | 20 | 24 |
| Stearns | 18 | 6 | 24 |
| Elmore | 11 | 9 | 20 |
| Pope-Hartford | 9 | 11 | 20 |
| Auburn | 0 | 19 | 19 |
| Colburn | 12 | 7 | 19 |
| Pilot | 8 | 10 | 18 |
| Marmon | 10 | 7 | 17 |
| Premier | 10 | 7 | 17 |
| Henderson | 10 | 5 | 15 |
| American | 8 | 6 | 14 |
| Crow | 5 | 9 | 14 |
| Lambert | 0 | 14 | 14 |
| Cunningham | 12 | 0 | 12 |
| Hollier | 7 | 5 | 12 |
| Marathon | 6 | 6 | 12 |
| Westcott | 5 | 7 | 12 |
| Allen | 0 | 10 | 10 |
| Great Smith | 0 | 10 | 10 |
| Pratt-Elkhart | 0 | 10 | 10 |
| Smith | 10 | 0 | 10 |
| Continental | 7 | 1 | 8 |
| Little | 6 | 2 | 8 |
| Monarch | 8 | 0 | 8 |
| Renault | 8 | 0 | 8 |
| *Alco | 5 | 2 | 7 |
| Bergdoll | 5 | 1 | 6 |
| Imp | 0 | 6 | 6 |
| Moline | 0 | 6 | 6 |
| Petrel | 0 | 6 | 6 |
| Sears-Roebuck | 0 | 6 | 6 |
| Speedwell | 0 | 6 | 6 |
| Wayne | 0 | 6 | 6 |
| Welch | 0 | 6 | 6 |
| Capitol | 5 | 0 | 5 |
| Gleason | 0 | 5 | 5 |
| Parry | 0 | 5 | 5 |
| Warren | 0 | 5 | 5 |
| Glide | 0 | 4 | 4 |
| Jones | 0 | 4 | 4 |
| *Schacht | 0 | 4 | 4 |
| Stutz | 4 | 0 | 4 |
| Total | 9,161 | 25,439 | 34,598 |

### GASOLINE TRUCKS

| Make | Denver | Outside | Total |
|---|---|---|---|
| I. H. C. | 27 | 66 | 93 |
| Chase | 27 | 29 | 55 |
| Commerce | 14 | 6 | 20 |
| **G. M. C. | 18 | 12 | 30 |
| Hercules | 6 | 12 | 18 |
| Rapid | 9 | 7 | 16 |
| Federal | 12 | 3 | 15 |
| Columbia | 4 | 5 | 9 |
| Denby | 5 | 4 | 9 |
| Mack | 5 | 4 | 9 |
| Autocar | 5 | 3 | 8 |
| Brockway | 8 | 0 | 8 |
| Garford | 7 | 1 | 8 |
| Kelly | 8 | 0 | 8 |
| Wichita | 0 | 7 | 7 |
| Little Giant | 4 | 2 | 6 |
| Sampson | 6 | 0 | 6 |
| Wilcox | 6 | 0 | 6 |
| Randolph | 0 | 4 | 4 |
| Total | 171 | 165 | 335 |

### ELECTRIC VEHICLES

| | | | |
|---|---|---|---|
| *Baker | 104 | 30 | 134 |
| Fritchle | 119 | 14 | 133 |
| Detroit | 54 | 32 | 86 |
| Ohio | 55 | 6 | 61 |
| *Waverly | 39 | 6 | 45 |
| Rauch & Lang | 29 | 9 | 38 |
| Columbia | 25 | 2 | 27 |
| Hupp-Yeats | 11 | 9 | 20 |
| Studebaker | 18 | 0 | 18 |
| †General Vehicle | 16 | 0 | 16 |
| Babcock | 5 | 3 | 8 |
| Woods | 0 | 6 | 6 |
| Flanders | 4 | 0 | 4 |
| Total | 479 | 117 | 142 |

### STEAM CARS

| | | | |
|---|---|---|---|
| Stanley | 65 | 75 | 140 |

### MISCELLANEOUS

| | | | |
|---|---|---|---|
| Various makes | 169 | 145 | 314 |
| Grand total | 10,045 | 25,931 | 35,893 |

NOTE:—*Includes trucks. **Includes electric trucks. †Trucks. ††Includes trucks and steam passenger cars.

Overland holding second place with 2926, Buick third with 2369 and Maxwell fourth with 1707. Of the Fords 3494 are registered in Denver and 12,233 in the rest of the State. There are 659 Overlands in Denver and 2267 outside the city. Denver has 437 Buicks as compared with 1932 for the balance of the commonwealth and 534 Maxwells as against 1173 outside.

These four cars held the first four places last year, but Overland is now credited with second position, which was held by Buick last year.

Of the total of 35,893 registrations available when the analysis by make was undertaken this week, 34,598 were gasoline passenger cars, 335 gasoline trucks, 142 electric vehicles, including passenger cars and trucks, 140 steam machines and 314 miscellaneous. The latter being those whose make and type were not apparent from the registration records. The tabulation herewith shows the number of each make registered in Denver and the rest of the State, the number in each county being given in the second table. The county registration is not entirely complete but approximates the correct figures very closely.

**Increased Gains Each Year**

A study of the registrations in Colorado for the past three years brings out strikingly the tremendous increases made each year.

To the 1913 registration of 13,624 cars, 1914 added 4809 cars, or an increase of 35 per cent, while 1915 showed a gain of 9821 cars, or 53 per cent, over 1914, and this year promises a gain of 15,000 to 18,000 cars, or more than 50 per cent over last year.

The record for the lone carless county is still held by Dolores County, located in the extreme southwestern corner of the State, highly mountainous, thinly settled and with few roads.

**REGISTRATION BY COUNTIES**

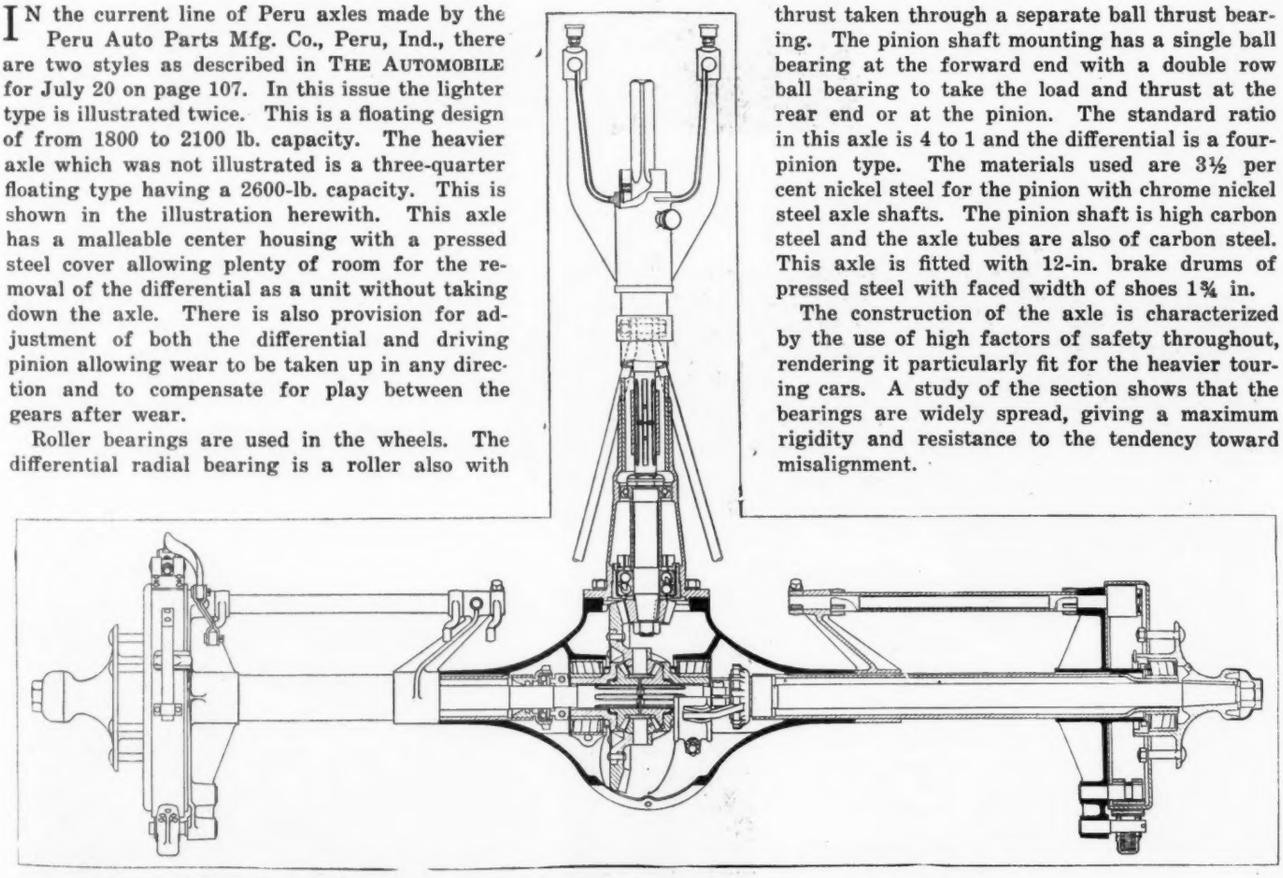
| County | Cars | County | Cars |
|---|---|---|---|
| Denver | 10,378 | Saguache | 229 |
| Weld | 2,811 | Alamosa | 222 |
| El Paso | 2,680 | Crowley | 193 |
| Boulder | 1,989 | Baca | 186 |
| Pueblo | 1,984 | Sedgwick. | 181 |
| Larimer | 1,960 | Douglas | 179 |
| Otero | 913 | Conejos | 167 |
| Las Animas | 862 | Routt. | 154 |
| Prowers | 775 | Cheyenne | 139 |
| Morgan | 747 | Lake | 136 |
| Yuma | 736 | Kiowa | 124 |
| Logan | 694 | Rio Blanco. | 109 |
| Fremont | 616 | Gunnison. | 107 |
| Mesa | 545 | Park | 105 |
| Jefferson | 539 | Montezuma | 93 |
| Arapahoe | 512 | Ouray | 93 |
| Delta | 497 | Costilla | 92 |
| Rio Grande | 490 | Eagle | 92 |
| Washington | 478 | Moffat | 90 |
| Montrose | 451 | Jackson | 87 |
| Kit Carson | 384 | Clear Creek | 79 |
| Teller | 375 | San Miguel. | 70 |
| Lincoln | 367 | Pitkin | 64 |
| Bent. | 365 | Archuleta | 57 |
| Garfield | 356 | Grand | 57 |
| Phillips | 346 | Custer | 53 |
| Chaffee. | 339 | Summit | 40 |
| Huerfano | 318 | Gilpin | 34 |
| Adams | 304 | Mineral | 26 |
| Elbert | 298 | San Juan | 16 |
| La Plata | 244 | Hinsdale | 8 |
| | | Doloros | No report |

# Peru 2600-Lb. Axle with Malleable Housing

IN the current line of Peru axles made by the Peru Auto Parts Mfg. Co., Peru, Ind., there are two styles as described in THE AUTOMOBILE for July 20 on page 107. In this issue the lighter type is illustrated twice. This is a floating design of from 1800 to 2100 lb. capacity. The heavier axle which was not illustrated is a three-quarter floating type having a 2600-lb. capacity. This is shown in the illustration herewith. This axle has a malleable center housing with a pressed steel cover allowing plenty of room for the removal of the differential as a unit without taking down the axle. There is also provision for adjustment of both the differential and driving pinion allowing wear to be taken up in any direction and to compensate for play between the gears after wear.

Roller bearings are used in the wheels. The differential radial bearing is a roller also with thrust taken through a separate ball thrust bearing. The pinion shaft mounting has a single ball bearing at the forward end with a double row ball bearing to take the load and thrust at the rear end or at the pinion. The standard ratio in this axle is 4 to 1 and the differential is a four-pinion type. The materials used are 3½ per cent nickel steel for the pinion with chrome nickel steel axle shafts. The pinion shaft is high carbon steel and the axle tubes are also of carbon steel. This axle is fitted with 12-in. brake drums of pressed steel with faced width of shoes 1¾ in.

The construction of the axle is characterized by the use of high factors of safety throughout, rendering it particularly fit for the heavier touring cars. A study of the section shows that the bearings are widely spread, giving a maximum rigidity and resistance to the tendency toward misalignment.



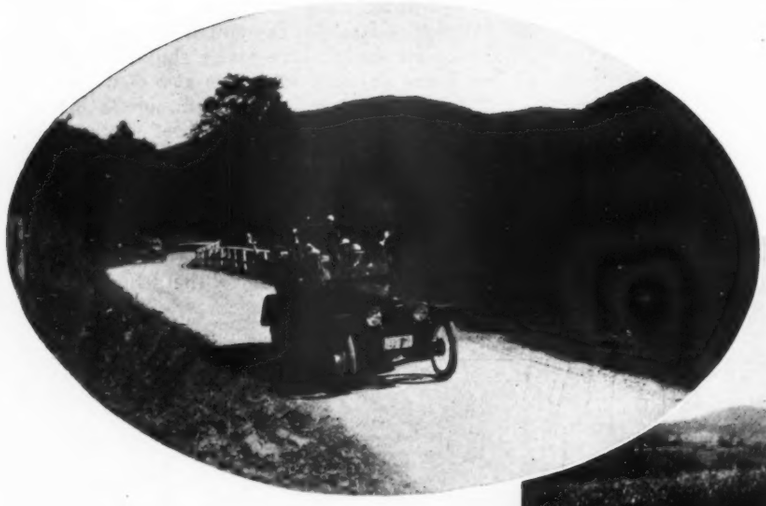
Section through the Peru 2600-lb. axle, which is a three-quarter floating type

# Glimpses of Owen-Tour Through

Over Fifty Men Guests tion Tour Through Pictur

*A brief stop at one of the many beautiful points along the Connecticut River in Vermont, where the river winds between the sloping hillsides*

*The famous horseshoe on Mohawk Trail ascending the mountain between North Adams and Greenfield*



*Above — Along one of the good stretches of road on the main highway between Boston and Bretton Woods*

*Right—An example of the roads construction found in Massachusetts*

# Magnetic Cars on 5-Day New England

of R. M. Owen on Invita-esque Mounta'n Sections

*Owen tourists rolling along roads in New Hampshire which represent the ideal for automobile drivers*

*Where over fifty Owen tourists spent the night—at Profile House in the White Mountains*

*Above—Another view in the Vermont section of the Connecticut Valley along the highway to the White Mountains*

*Left—The eleven Owen-Magnetic cars on the tour on New York highways north of New York City*

# Liberty Production on Quantity Basis

## In Half Year of Company's Existence Scientific Plant Has Been Developed and Sales Approach $5,000,000

AN excellent example of the rapidity of industrial organization and immediate launching into manufacturing activity which is characteristic of the automobile industry, is the progress made in 6 months by the Liberty Motor Car Co., Detroit, Mich. This company, though incorporated only last February, already has a scientifically laid out factory and has been turning out cars in quantity for 2 months. The merchandising side of the business has kept pace with the manufacturing end and sales of the new Liberty six are approaching the $5,000,000 mark, distributing representation having been secured in practically all the leading cities of the country.

The first Liberty car was on the road in April. The factory buildings formerly occupied by the R-C-H Corp. were secured and remodeled to suit the new conditions. New buildings were constructed and old ones rearranged; and equipment to care for modern progressive assembly seemed veritably to be in the plant over night, so industriously did the entire organization work.

By July 4, all was ready; materials having been purchased and delivered, and everything in order. According to a prearranged schedule, cars bearing the Liberty name were being produced long before the end of July, and in presentable quantity.

### Ideal Assembly Plant

The buildings are one story and spacious so as to make an ideal assembly plant. Progressive assembly, following a chain system that is slightly modified to meet the needs of the concern, is used. A moderately inclined track has been built down the center of the largest of the group of buildings, this track being about 275 ft. long. At the starting point it is elevated about 1½ ft. above the floor, and at the finish end it slopes down to floor level. The object of this very slight incline is to make it very easy to move the cars along after each operation. A slight push moves the vehicle without effort, and gets away from the necessity of a power conveyor of any sort. Further, the elevating of the track makes it more comfortable for the men, who can work standing at normal height without platforms or falsework. This results in higher speed and, consequently, greater production.

### The Assembly Circle

About thirty cars can be accomodated by this assembly track at one time, and the chassis parts are stored on either side of the track. Beginning at the opposite end from the start of the inclined final assembly track, the frames commence their journey through the frame and spring assembly departments and wind up at the chassis paint. Simultaneously in another building, the unit power plants are assembled and prepared for the block test. After passing this examination, the motors go to a position beside the track from which they can advantageously be assembled to the chassis. Thus, beginning at one end, a swing in a complete circle is accomplished, and when discharged from the main line, the completed cars are road-tested and then driven 100 ft. to the long loading platform.

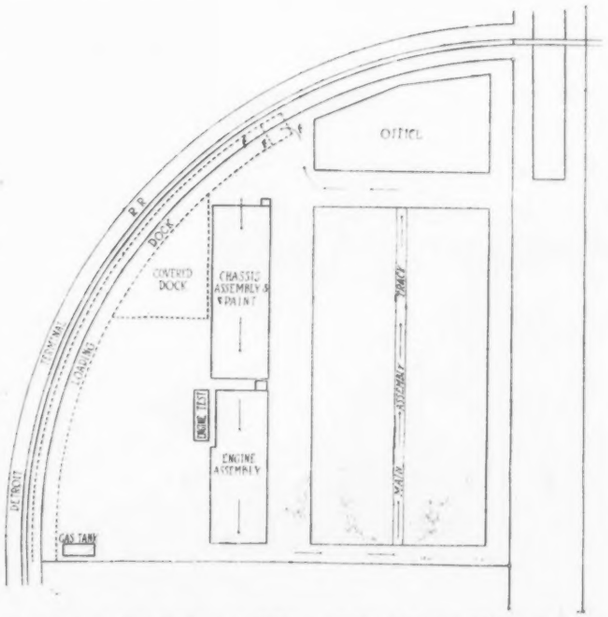
This summary of operations will show that Liberty has laid out its plant scientifically, and in accord with the best experience in building cars rapidly and substantially. It shows that entering into the manufacture of automobiles to-day is no venture for a weak organization, but that brains and experience, backed up by a reasonable amount of money, can succeed even against the great handicap of going into a field of manufacture that is now most keenly competitive.

## 15.4% of N. Y., N. J. and Pa. Roads Are Bituminous

ROADS treated with bituminous preparations constituted 15.4 per cent of the highways in the three middle Atlantic States, New York, New Jersey and Pennsylvania, in 1914, as compared with 1 per cent in the same States in 1909. This improvement is entirely due to the increase in the use of automobiles and trucks, according to the third 5-yearly study of road mileage, road types and highway finances in these States reported by the Office of Public Roads and Rural Engineering in department bulletin No. 386.

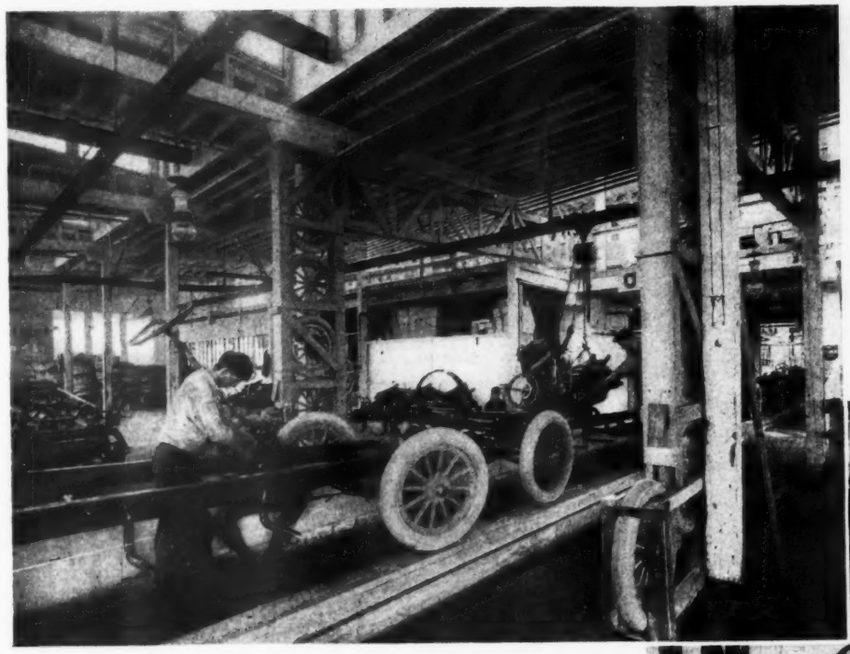
Approximately 9 per cent of the improved road mileage of the three commonwealths is now surfaced with concrete brick or other of the more substantial materials used in road construction as compared with 1 per cent in 1909. In 1904, when the first road study was made neither bituminous nor the more substantial roads were found, untreated macadam and gravel roads predominating. Roads of the unimproved type were reduced from a percentage of 51 to only 39.3 in the 5 years from 1909 to 1914.

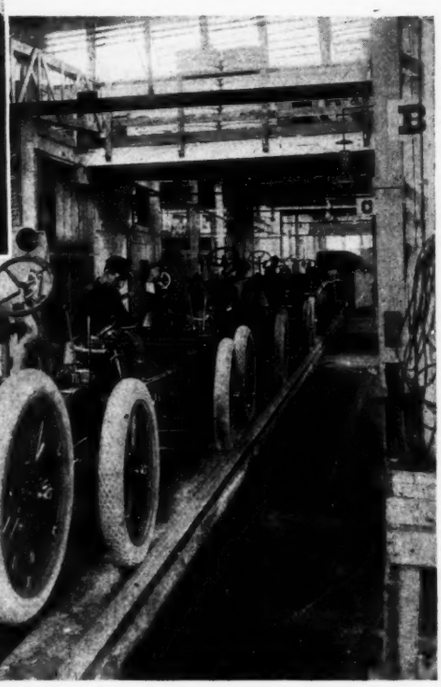
On Jan. 1, 1915, the three States mentioned had roads totaling 185,770.84 miles, Pennsylvania having approximately 91,500, New York 79,000 and New Jersey 15,000, these statistics being exclusive of practically all streets in incorporated cities and towns. New Jersey added 17 per cent of surfaced roads in the 5 years from 1909 to 1914, Pennsylvania 7 per cent and New York 3.5 per cent.



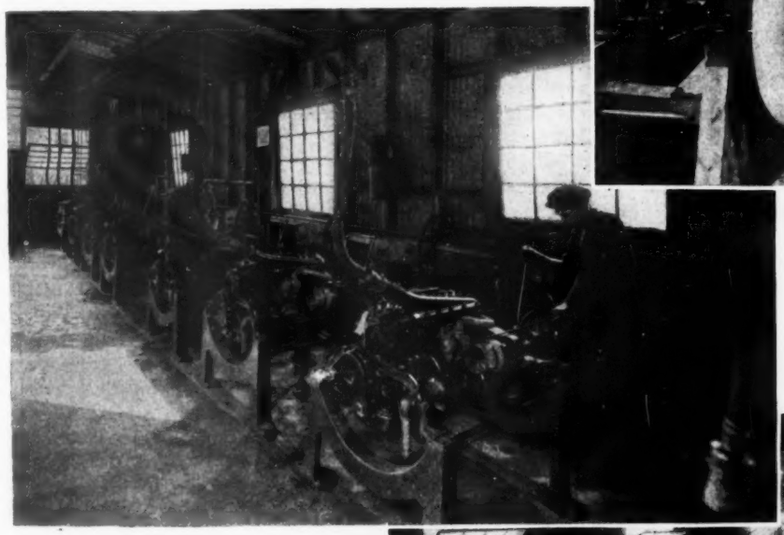

Layout of the factory buildings of the Liberty Motor Car Co.

# Progressive Assembly System Speeds Up Liberty Production





*At the start of the assembly line in the factory of the Liberty Motor Car Co., Detroit, Mich. The chassis run down the track accumulating their component parts as they progress. Note the engine being lifted into place at the right and the overhead runways delivering wheels from the stockroom*



*A vista down the inclined assembly track, showing the chain of Liberty six chassis gradually growing into complete cars fitted with bodies, tops, etc., at the farther end of the line*

*Above—Part of the engine testing room at the plant of the Liberty Motor Car Co., showing the type of testing blocks used and the cooling water connections employed for the test runs*

*Right—A view of the engine assembly department at the Liberty factory, showing how each engine is mounted on a rolling stand, rendering it easy to move it from point to point as needed. Note the gearbox, bell housing and control assemblies in the background waiting to be mounted*

# The Rostrum

## Why Four-Cylinder Pistons Are Larger

EDITOR THE AUTOMOBILE:—Will you kindly tell me why the piston is larger in four-cylinder cars than in six and eight-cylinder cars and why they will develop more power than a four-cylinder?

Harrodsburg, N. Y. H. G. S.

—The reason that the bore of the four-cylinder motor is in general less than that of six and other multi-cylinder engines, is simply because of the fact that more power than is necessary for the car is not desired. Every cylinder assembly acts as a separate engine in supplying power. The same amount of power can be obtained from six smaller cylinders as from four larger ones. Hence, to secure the desired amount of power with four cylinders, it is natural that each of the cylinders should be made larger.

Looking at the matter from another angle, that of piston displacement, it will be remembered that displacement is a direct factor of power. If a displacement of, say, 300 cu. in is desired and if enough power will be secured from this displacement, it would be obtained by using four cylinders of 75 cu. in. displacement or six cylinders each having 50 cu. in. displacement. Naturally, the pistons for the 75 cu. in. cylinder will be larger than those for the 50 cu. in.

### Naphthalene Not Recommended in Fuel

Editor THE AUTOMOBILE:—Please advise me as to the use of naphthalin or naphthalene with flakes in gasoline for increasing mileage and as a carbon remover. It has been recommended to use a teaspoonful to every 5 gal. of gasoline and I am told that this substance is put up under many names and sold for that purpose. Please advise me as to its qualities and how it works and if you advise me to use same, giving reasons for your conclusions.

Fall River, Mass. E. J. D.

—The use of naphthalene or, as it is commonly known, camphor, is not recommended in gasoline. As a matter of fact it will deposit as much carbon as it will remove and will result in a sooted engine. A simple experiment which will readily show you the carbon-forming tendencies of camphor may be performed by simply holding a camphor or mothball over an open flame. The carbon will leave the camphor in long string-like formations.

### Compression Bad on Three Cylinders

Editor THE AUTOMOBILE:—I have a 1916 model 43 Oldsmobile which has poor compression on all but one cylinder when cold, but does not show so much difference when hot. I have had the head off and ground the valves. I think it is in the gasket joint as the old gasket showed black carbon streaks, especially between cylinders. It hasn't the power it should have and has only run 2200 miles. Would it help any to put in two gaskets and shellac all sides of them, or is there anything else that will make it hold?

2—I am getting about 15 miles per gallon of gas. How many should I get with a new Stromberg carbureter?

3—Will this carbureter increase the power acceleration speed and make starting easy?

4—Is the Fracto a good device for headlights? Will it prevent glare and give good driving light?

Kenosha, Wis. T. A. F.

—Since the old gasket shows carbon streaks it is quite likely that you are right in your surmise that the car is losing power due to leakage. The new gaskets well shellaced may remedy the trouble. Also, go over the intake manifold connections very carefully and be sure that there are no air leaks around these.

2—It is pretty difficult to state what mileage you should get to a gallon of fuel without knowing how fast you drive, what load is carried in the car and other details which have their effect. In all probability, however, 15 miles to a gallon is a good average consumption.

3—In fixing upon a carbureter for their car the Oldsmobile engineers have no doubt taken all the matters which you mention into consideration, and while it is within the realms of possibility that you may secure a gain by changing your carbureter there is no reason why you should not get satisfactory service from the one which is on your car.

4—THE AUTOMOBILE has never had an opportunity to test out this device, but no doubt you could secure a demonstration from its manufacturers.

### Redesigning Michigan Radiator

Editor THE AUTOMOBILE:—I desire to make a change in the radiator design of my 1913 Michigan car. I have designed one of the following dimensions and would like to know if it is large enough to cool a four-cylinder motor of 4¼ by 5¼ bore and stroke. The height is 25¾, width 22½ and 3¾ in. through cross section. The design is the same as the 1916 Mercer.

Pittsburgh, Pa. N. H.

—The radiator you mention would be sufficient, provided you have good pump delivery. The cooling of an engine does not depend so much on mere capacity of the radiator as it does on the volume of water that is handled in a unit of time. The purpose of the radiator is to carry a given number of B.T.U. from the engine in a given amount of time. Generally, the thermal units lost through the cooling water are about 35 per cent of the heat taken into the engine with the fuel. Under abnormal conditions, such as climbing long hills, this percentage will increase to as high as 50 and if the cooling chamber is too small it will go above the capacity of the radiator, causing overheating.

The method of determining the amount of heat carried off by the radiator is to first measure the quantity of water in cubic feet passing through the cooling system in 1 min. The temperature of the entering water is then subtracted from the temperature of the water leaving the jackets, giving the range between extreme temperatures. This temprature range is multiplied by the cubic feet of water passing through in a minute to determine the B.T.U. per minute. Knowing the calorific value of the fuel, the theoretical radiator can be readily determined in the manner suggested.

As a matter of fact manufacturers of cars do not determine their radiator size so much by the theoretical calculation as they do from a knowledge of what can be expected from a given size engine, a pre-determined pump and a known radiator size. This is a matter of development and even calculating on this basis errors have been made which have resulted in a necessary increase of radiating surface. Radia-

tors of different forms have different efficiencies and the mere capacity and dimensions of a radiator do not tell anything unless its efficiency is known. You do not mention the form of radiator you are employing, but, assuming it to be of the honeycomb type, it will be sufficiently large if the pump capacity is great enough to keep the radiator filled with rapidly flowing water at low engine speeds.

Even the fan design is of greatest importance in cooling. A fan that is sufficient for one radiator will be bad for another. The reason for this lies largely in the shape of the radiator, which may be such that it does not permit the fan to draw through all sections. A simple test can be made to determine the area of draw of the fan by placing small pieces of paper against the outside of the radiator when the engine is turning over at idling speed, and seeing if the paper remains drawn against the face of the radiator. It very often happens that certain areas of a radiator have a positive back current or eddy passing through them which instead of pulling cold air from the exterior of the car gives a flow of warm air which has been heated from its confinement beneath the hood.

## Information on Stearns-Knight Engine

Editor THE AUTOMOBILE:—What are the most difficult features to overcome in the manufacture of a Knight eight engine? What part of the motor would be most likely to give trouble in operation, that is, in ordinary touring service?

2—Kindly illustrate the Stearns-Knight six engine in THE AUTOMOBILE. I wish to know the distance from driveshaft of transmission to front of engine, also width from tip to tip of arms that the engine is hung on, and distance between front and rear arms.

Swan Lake, Miss. H. D.

—In manufacture there is little doubt but that the grinding work is the thing which must be watched closest on a Knight eight-cylinder engine. This must be accurate for all cylinders. As for trouble in operation, there is no reason why any part should be conspicuous in this respect after manufacture has been carefully carried out.

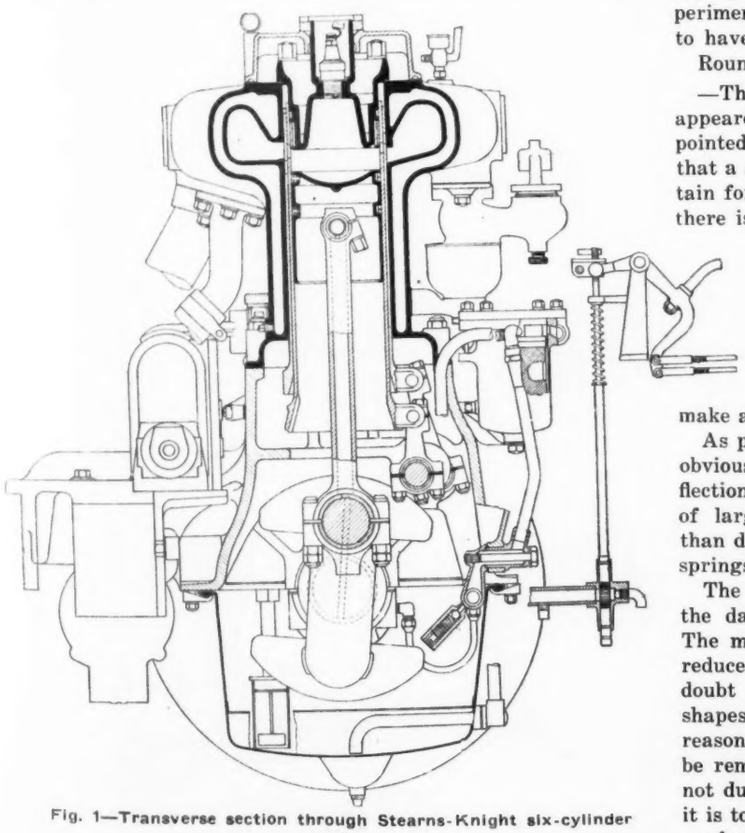


Fig. 1—Transverse section through Stearns-Knight six-cylinder engine

2—The Stearns-Knight engine is shown in section in Fig. 1. The distance from the driveshaft of the gearset to the front of the motor is 39⅜ in. The width of the arms in front is 20¾ in. and at the rear 26⅞ in. The distance between the front and rear arms is $18\frac{13}{16}$ in.

## Believes in Full Elliptic Springs

Editor THE AUTOMOBILE:—There has been much speculation as to the most comfortable spring for the automobile, but strange to say, the full elliptic spring is not mentioned. This is probably due to the fact that so few have had the experience of riding in cars fitted with these springs, as the conventional half and three-quarter elliptic are mostly used.

I claim that there is nothing that can approach the full elliptic both front and rear, with the front spring slightly tilted backward, as in the Franklin, to receive road shocks. This may seem a broad assertion, but it is conceded by everyone who has had experience. There may be a few very heavy, high-priced cars fitted with deep cushions and shock absorbers that give comparative ease, but I am speaking of the ordinary size car. This also holds true with respect to pleasure wagons as long ago the elliptic spring was used. Then came the desire for something better and all sorts of springs were tried, but they soon disappeared and the elliptic came back and stayed because the principle was right.

I would like to ask why manufacturers of automobiles do not use them more. Is it the cost, or the difficulty of attachment on a steel chassis, or both? Is it the appearance that is objectionable? There are thousands of cars made to-day that meet every requirement except riding qualities, and we believe it would be a big selling factor if some other leading makers would adopt the elliptic spring. It sold my car after trying a score of others and after using it 5 years and experimenting with different models it would seem a hardship to have to change.

Round Top, N. Y. J. W. F.

—The point you bring up is covered in an article which appeared in THE AUTOMOBILE for Sept. 7, page 393. As pointed out in this article, by A. Ludlow Clayden, the idea that a spring had some special virtue because it was of a certain form has been pretty well exploded. On the other hand, there is no doubt that certain forms of springs have certain advantages but no spring is easy riding simply because of its external shape. It is rather in the development of its individual units that the secret of its success will be found alive. The length of the spring and the number of leaves have a marked effect regardless of the shape, and the ratio of sprung to unsprung weight of the chassis will also make a material difference.

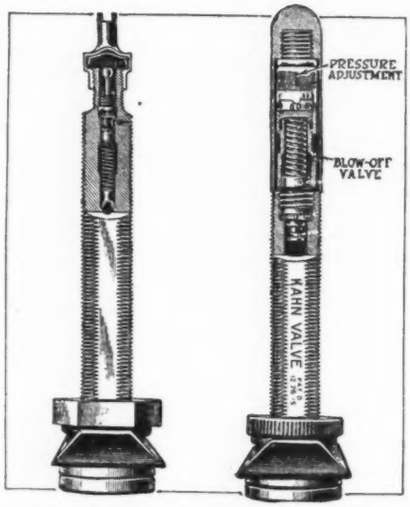
As pointed out, in the article mentioned, a long spring will obviously alter its curvature less for a given amount of deflection than a shorter spring, since the tangent to the circle of large diameter more closely approaches the periphery than does a tangent to a small circle. Fiber stresses on long springs are also less than on shorter ones.

The number of leaves in a spring has a direct effect upon the damping action which reduces the bounce or rebound. The more leaves there are the greater the surface area to reduce the throwing action of the spring by friction. No doubt manufacturers find that the chassis weights and shapes suit certain springs better than others, and for this reason a variation will be found in external shape, but it must be remembered that where easy suspension is obtained it is not due so much to the virtue of the shape of the spring as it is to the scientific way in which the spring design has been worked out.

# ACCESSORIES

### Armstrong Inner Tubes

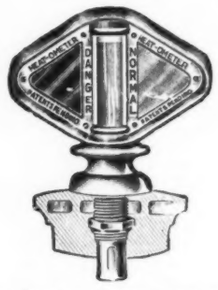
LONGER tube life and greater comfort and convenience for the car owner are the features claimed for Armstrong inner tubes, due to the use of the Kahn automatic valve. As shown in the accompanying illustration, this valve differs from the conventional type in that it is provided with a blow-off valve and a pressure adjustment so that when the desired degree of inflation has been reached no more air enters the tire and the whistling of the blow-off indicates the fact. The valve also differs from the usual type in that the valve stem fits through a hole in the body of the valve instead of having the stem screwed into the body of the valve. The operation of the pressure adjustment is clearly shown in the illustration. The inner tubes themselves are laminated, being made of heavy red rubber. The manufacturer controls the Kahn valve construction and states that the tubes sell at standard prices.—Armstrong Rubber Co., Inc., 118-122 Adams Street, Newark, N. J.




Left—Conventional tire valve. Right—Kahn valve used in Armstrong tubes

### Heat-Ometer

This instrument is intended to apprise the driver of an overheated condition of his engine. As shown in the illustration, it is inserted through a hole drilled in the radiator cap and held in position by a lock nut. A diamond-shaped frame holds the glass indicator tube containing a sensitive liquid, which is pink at normal temperatures, but turns a deep purple when a dangerous degree of heat is reached. The frame at each side of the tube is paneled, one side being enameled pink and the other purple, enabling the driver to check the engine temperature by comparison. The standard size sells for $3, and the junior for $2.—Heat-Ometer Co., Inc., 1 Broadway, New York City.

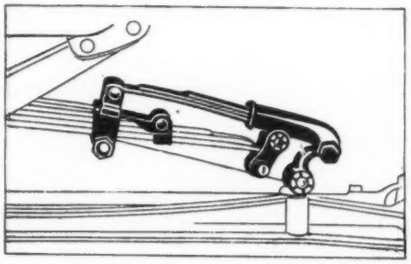


Heat-Ometer, a radiator gage

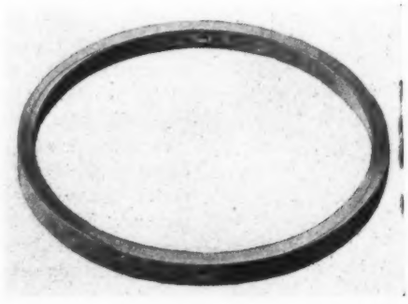
### United Stands and Cranes

The Every-Way engine stand supports the engine while being overhauled, allowing the workmen to reach every portion with ease. The base is composed of two steel Z-bars bolted to the floor. To this two uprights of cast iron are fastened, cored hollow, with vertical slots in which the two steel brace clamping nuts travel. One upright is rigidly bolted to the base, the other being adjustable to take any width of engine, and is locked in a manner similar to the tail stock of a lathe. The supporting arms for the engine are steel angles, with numerous holes bored both in the horizontal and vertical sides. These angles are pivoted in the center to the two uprights. The engine is bolted to the angles by the same supporting brackets that support it in the chassis. The height to the top of the angles from the floor is 30 in.; length of angles, 42 in.; length of base, 52 in.; weight, 185 lb.

A portable, hand operated floor crane, having the high lift and deep overhang required in repair shop work, is also manufactured. A heavy cast iron base, mounted on truck wheels, supports the light steel superstructure carrying the hook, chain and drum. Because of the heavy base and light upper structure, the center of gravity is very low, preventing top-heaviness, and permitting a high lift. The U-shape of the base allows the crane to be placed in any desired position about the car, and is narrow enough to pass between the wheels of a car. Prices, No. 66, 1-ton, 6 ft. 6 in. lift, 33 in. overhang, $64; No. 76, 1-ton, 7 ft. lift, 33 in. overhang, $66; No. 80, 2-ton, 7 ft. 6 in. lift, 36 in. overhang, $82.—United Engine & Mfg. Co., Hanover, Pa.



Duplex cantilever spring for Fords



Hi-Comp piston ring composed of two eccentric interlocking rings

### Hi-Comp Piston Rings

Two eccentric interlocking rings combine to form a single concentric ring. The rings are made from soft gray iron and ground together. It is not necessary to take the rings apart, as they expand sufficiently to fit over the piston. The design of the ring is said to give an equal expansive power on all parts of the cylinder, even though worn out of round. Two rings only are required for each piston. Price, all sizes to 5½ in., $1.65 each.—Continental Piston Ring Co., Memphis, Tenn.

### Duplex Cantilever Springs

A new type of auxiliary spring for Ford cars has been developed in the Duplex cantilever spring. Upon each end of front and rear springs one of the Duplex springs is fastened, the upper end being secured at about half the distance to the middle of the standard Ford spring; the lower end under the front springs is attached to the present Ford perch and the front spring suspended

Every-Way engine stand, showing mounting of engine

from the Duplex spring, producing a cantilever action. This is said to eliminate side-sway and promote easy riding of the body. The rear Duplex springs attach to the perch in the same manner and add 5 in. to the span of the ordinary Ford spring. A set costs $15. —Duplex Cantilever Spring Co., Chicago, Ill.

**Wegman Automatic Decarbonizer**

This device supplies moisture to the intake manifold. Water is taken from the waterjacket above the carbureter down through tubing to the intake manifold, where it is carried with the mixture to the cylinders. The amount flowing is regulated by a needle valve used in connection with a sight feed glass on the tubing, and the supply is automatically shut off when the engine stops by a ball check valve. The device may be attached to any make motor by drilling and tapping two ⅛-in. standard pipe tap holes—one in the intake manifold and one in the waterjacket. It is claimed that the water is turned to superheated steam by the explosion temperature, which removes the carbon and increases the power of the engine. Price, $5.—Manufacturers Distributing Co., 400 Publicity Bldg., St. Louis, Mo.

**Morton Front Wheel Brakes**

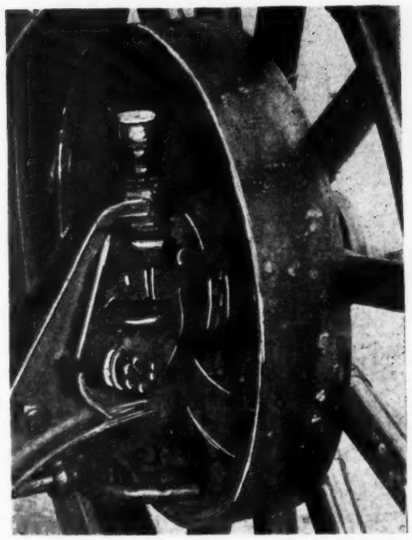
Designed to supply a front wheel braking system for most makes of cars, no alterations to the car are required in the installation, and the brakes are said not to interfere with the proper operation of any part of the car. The brakes are of the expanding type, and so connected that the braking effort is applied to all four wheels at once. Quickness in stopping and prevention of side sliding or skidding are the advantages claimed for these brakes.—Morton Brake Co., 45 S. Tenth Street, Minneapolis, Minn.

**Comet Dash and Trouble Lamp**

A combination dash and trouble lamp. On the dash, behind the lamp socket, is an automatic reel carrying 10 ft. of lamp cord. A spring in the rewind reel holds the lamp to the dash as a dash lamp. When used as a trouble lamp, it is freely portable. Price, $5.—Auto Specialty Co., Galesburg, Ill.

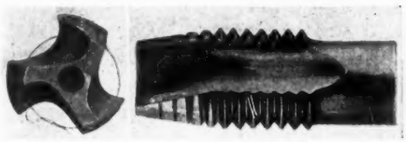
**New Greenfield Tap**

This tap, styled the "Gun" tap, is so made that it cuts with a shearing action, curling the chips ahead of the cutting edge and preventing clogging. The cutting edges are ground at an angle at the point, permitting the tap to cut freely and make clean, sharp threads. The body of the top has no cutting action, only serving to hold the work true to lead. The taps are made with two or three flutes only, left shallow so that the tap is nearly as strong as the solid stock. It is claimed that chipping is confined to the cutting edge, which may easily be reground. Regrinding may be repeated until only two or three full threads are left, it is said, and will retain its cutting size to that limit.—Greenfield Tap and Die Corp., Greenfield, Mass.

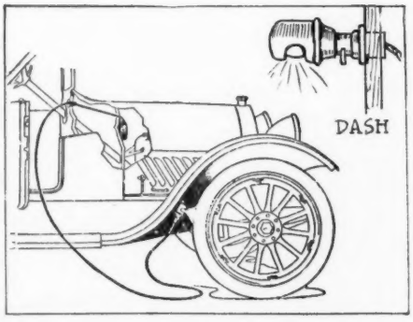


The Morton front-wheel brakes are of the expanding type, and connected with the rear-wheel braking system

Wegman Decarbonizer, which supplies moisture to the intake manifold, draining the water from the waterjacket



The new Greenfield tap




Comet dash and trouble lamp combined

**Ventilating Hood Holder**

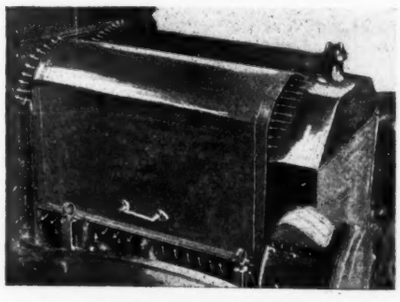
This ventilator is intended to permit the free circulation of air beneath the Ford hood. These holders are substituted for the standard Ford clamps, and allow the hood to be clamped in an elevated position. The forced draft caused by the motion of the car passes over the motor, and escapes at the rear. The running temperature of the engine is lowered, and the performance of the engine is bettered, it is claimed. In cool weather the hood may be locked in the closed position. Price, per set of four, $4.50.—V Air Valve & Mfg. Co., Denver.

**M. & E. Metal Shingles**

Light, fire and storm-proof metal shingles are made up of copper, tinplate or galvanized iron. Constructed on scientific principles, this shingle can be put on more readily than any other form of metal roofing, it is said. Expansion and contraction are provided for; and the large overlap makes an absolutely tight roof of one-sixth pitch or over. A pleasing appearance, combined with reliability at a moderate cost are the advantages claimed for this type of shingle. Prices, Gothic, 14 by 20 size, 68 shingles per square, $4 painted, $5.75 galvanized.—Merchant & Evans Co., Philadelphia, Pa.

**Lally Motor Tread Mill**

Power for driving a saw or any machine requiring a power drive may be taken from the rear wheels of a car by the use of this device. It consists of a frame carrying a cross shaft with three pulleys and a jacking device which lifts the car wheels and presses them against the two outer pulleys on the shaft. When the engine is run the shaft is driven and power taken from the middle pulley by a belt. The jacking device is operated by a screw and the tension of the rear tires against the drums may be adjusted.—Lally Commercial Body Co., Everett, Mass.



Ventilating hood holder

The Automobile

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# Building vs. Assembling

MANY of the manufacturers who commenced their business as chassis assemblers, using stock parts throughout have recently changed their system, and some of them now make all the principal parts of their car. This has come about in two ways. In some cases the manufacturer has enlarged his factory and equipped to make his own parts in the parent plant, as for example the Hudson extension for the making of the Super-six engine. Others have bought up parts producing plants, as for example the complete absorption of various parts makers into the General Motors organization.

It is interesting to speculate as to the ultimate effect, and the reasons for the observed changes in policy. No doubt several automobile assemblers have been driven to making their own parts by failure of their original supplier to make deliveries on schedule. In other words the condition of the materials market has reacted via the parts maker and has mildly frightened the automobile producer. In other cases the desire for a distinctive design has been the mainspring.

Meanwhile the parts makers have all improved their plants and nearly all have enlarged; they have better facilities than ever before, so when the cost of raw material comes down again, the parts makers will be able to offer very tempting prices indeed. In conditions of enormous demand and high material cost it is less easy for the parts specialist to hold his own against the car builder with a fairly large output, than it is in normal times.

No other industry owes so much to detail specialists as does the automobile industry and it is hard to believe that the parts makers will not be able to retain their position as conditions ease, so any great extension of individual manufacture of complete cars is unlikely. In another 3 or 4 years we ought, however, to be able to see clearly when it does pay to make parts specially for one car and when it does not, a matter which is still debatable.

# "Tanks"

THE huge war machines which have just made their appearance as participators in the British advance on the Somme seem, from the cabled reports, to be exactly what so many war story writers of the past have imagined. H. G. Wells pictured just such machines 10 or 12 years ago in one of his novels, and the impregnable motor car has been used by many another author of fiction.

### A Matter of Cost

That such machines were possible, that even bigger ones could be built, has been known to automobile engineers for a long time. What has hitherto been lacking was sufficient funds to enable sufficient experiment to be made. No doubt these British crawling forts are the product of many experiments and many failures, and they have been built with no regard whatever to their cost.

Of course we are still ignorant as to the exact size and detail of these machines, probably very little detail will be available till the end of the war. One certain thing, however, is that they must be vastly heavier than the biggest caterpillar tractor ever built in America if their power of crumbling down houses and breaking off trees is as great as the daily press reports state, even though it is reported that the chassis used in their construction are of American manufacture.

There is no fundamental reason why one could not build a land traveling machine as big as an ocean liner if there was any purpose to be served, just as there is no doubt an automobile could be built that would do 200 miles an hour, if the incentive were sufficient. It is, however, not easy to see how monster land machines could serve any useful purpose in peace time although many other war creations have afterwards found their place in the scheme of things and history may repeat itself once more in this connection.

# U. S. Troop Trucks

IT is about time that the United States government tried the motor truck as a means of transporting troops. The reflection of the French success on the Marne should be found in this country. Recently two regiments were transported 200 miles in 32 hours, using 132 trucks. This is only a start. Let us try longer distances with more men.

# Open Price Value in Co-operation

## Price Publicity and Profit-Sharing High Lights of Babson Conference

WELLESLEY HILLS, MASS., Sept. 15—The Third Babson Conference on Co-operation was held here Wednesday, Thursday and to-day. Its object is the promotion of co-operative competition, which includes the open price and profit-sharing.

The open price is the most radical part of the plan, for profit-sharing is quite extensively practised and is generally understood.

The open price means price publicity, and in those associations which are founded on this idea the members freely exchange the prices they make on different articles, the bids they submit on contracts, and even the cost of production.

It is opposed to price maintenance and yet it tends to reduce price cutting. The element of futurity is eliminated. No member tells what his price shall be, but, instead, tells what it has been or is now. This prevents unscrupulous buyers from playing one manufacturer against the other and beating down prices by false statements. But there is nothing to prevent any man making any price he wishes. He can sell below cost if he wants to. The big idea is that if all the prices are known to all there will be less tendency to cut ruinously than if all work in the dark and slash dangerously low to make sure of getting the business.

### Open-Price Operation

The open-price plan is operated through associations, which exchange the information through a bureau. There are about twenty associations to-day and the plans vary in detail. In some all the data connected with a sale is given—price, customer's name and cost. In others less is given, running down to the price alone.

The open-price part of the conference was devoted principally to an explanation of plans now in effect. The speakers were: D. B. Doremus, Salt Producers' Association; Ernest H. Gaunt, Optical Manufacturers' Association; W. V. Spaulding, Leather Belting Exchange, and H. S. Wales, Pressed Metal Association.

### Cost Finding

Another phase of the work of these associations is that of cost finding. Efforts are made to have manufacturers install systems that will tell them the exact cost of the product, which information will be of assistance in making prices. The speakers stated that cost systems disclosed some startling facts to manufacturers.

In the employees' profit-sharing part of the conference three plans were described:

1. Simple share in company's profits. Described by Everett Morse, president Simplex Wire & Cable Co., Cambridge, Mass.

2. Share in profits and stock interest in business. Plan used by Dennison Mfg. Co.; described by Mr. Dennison.

3. Share in profits under fraternal interest of company without interest in company. Plan of Ford Motor Co. Described by Dean S. S. Marquis, head of educational department of the Ford Motor Co.

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### Times Square Motor Supply Co. Formed with $1,000,000

NEW YORK CITY, Sept. 20—The Times Square Motor Supply Co. has been formed here to take over the business of the Times Square Automobile Co. and all its branches. The new company has $1,000,000 in preferred stock, all of which has been subscribed and 40,000 shares of common of no par value. The stock will be offered on the New York Curb.

All capital will be used in enlarging the business of the company, which plans to establish twenty new stores within 90 days and twenty more before May 1, 1917, making a total of fifty. Accessories will constitute the entire stock, neither new nor used cars being bought or sold.

Officers of the new company are: Morris Froehlich, president; Jesse Froehlich, vice-president; Louis Mansbach, treasurer; and John E. Gores, secretary.

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### Invents Two-Wheeled Armored Car

AUBURN, ILL., Sept. 16—S. J. Clark, this city, has invented a two-wheeled armored motor car, designed for military use, which he has submitted to the war department at Washington. The car is equipped with a small central wheel in front of the two main wheels. The principal object of the car is to protect men from fire while digging trenches, being easily shifted from point to point. It is also designed for patrol duty, operating under almost any kind of conditions, due to its light weight.

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### Crowther Chassis on View

ROCHESTER, N. Y., Sept. 15—A chassis has been assembled by the Crowther Motor Co. which incorporates the Duryea roller drive in which the power is applied to the rim of the wheel. This is now on exhibition at the Powers Hotel in this city. It is stated that the company will be soon ready for production in their Rochester plant.

# U. S. Caterpillar Battery

## Holt Machine Can Pull Big Guns at 3 M. P. H at a Big Saving

NEW YORK CITY, Sept. 20—Considerable excitement has been manifested in the daily press regarding the so-called Tanks or crawling forts in use by the British army. From the information that has leaked through the ever-vigilant censors it would appear that these are a super-developed caterpillar tractor, very possibly of Holt design as far as the chassis is concerned.

The success with which these heavy tractors seem to have been used on the other side lead to the natural question as to what has been done in this country along the same lines, and it is gratifying to note that while the United States has not as yet done anything on the heavily armored tractor very thorough data has been accumulated on the subject of tractor transport for heavy artillery.

It is understood that at the present time there is under process of organization a tractor battery in which an entire regiment with twenty-four heavy field pieces will be drawn by caterpillars. This organization will be ready, it is believed, in about a year and is to be stationed in the Hawaiian Islands. The battery which is to be known as the ninth heavy field artillery will have no horses at all, the caterpillar tractors taking the place of 1000 of these animals. The place of saddle horses will be taken by motor cycles and the reserve ammunition will be carried by motor trucks. It is very probable that this regiment will be equipped with artillery which will correspond to the famous German 42-cent. gun.

Full data as to costs, etc., have been worked out at the experimental station at Fort Sill, Okla., and it is found that in this heavy work the cost of the motor-drawn battery would be about $40,000 less than a horse-drawn one, and the annual saving of pay, clothing, rations and forage would be about $25,000.

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### A. S. A. E. Members Can Join S. A. E.

NEW YORK CITY, Sept. 20—Members of the American Society of Aeronautic Engineers can become members of the Society of Automobile Engineers without payment of initiation fees, provided these memberships are taken out within 90 days. This announcement was made in THE AUTOMOBILE last week, except that the name of the Aeronautical Society was used in error for the A. S. A. E. and it was stated that annual dues need not be paid. This should have referred to initiation fees.

# $500 Electric in Boston?

## Battery That Will Recharge and Marked Economy Features of New Car

BOSTON, MASS., Sept. 16—Plans are now under way here to build an electric car with a battery that will recharge itself when running on level ground, and which can run 2 or 3 days without getting a boost. It will run very cheaply, will weigh less than 1500 lb. and will sell in the neighborhood of $500. Plans are under way to place the stock on the market, and the men behind it are all big enough so that their names mean something. The man who has devised the machine has a national reputation in the electrical world, and is connected with the biggest company in the country making electrical apparatus.

An experimental car has been thoroughly tried out and it has proved a success.

More complete details regarding the new car will be available as soon as the manufacturing arrangements are under way.

### Lane Trucks Out Soon

KALAMAZOO, MICH., Sept. 16.—The new plant of the Lane Motor Truck Co., Kalamazoo, will be turning out manufactured goods within a short time. M. H. Lane reports that the necessary parts for a large number of trucks have been ordered and that the output will be marketed rapidly as soon as the new factory is ready for the work ahead.

### Light Four Tractor Tested

MARION, OHIO, Sept. 16—The Huber Mfg. Co. gave a demonstration of its Light Four tractor on the J. B. Guthery farm, located 2½ miles west of Marion, this week. The tractor pulled three 14-in. plows, plowing at the rate of a little better than 1 acre an hour. The furrow was 9 in. deep.

### Bound Brook Oil-less Bearing Co. Adds

BOUND BROOK, N. J., Sept. 16 — The Bound Brook Oil-less Bearing Co., is erecting a re-enforced concrete addition, 50 by 100, to its plant No. 2, to take care of the increased business in Nigrum impregnated wood bearings.

### Hench & Drongold to Make Automobile and Truck Bodies and Parts

YORK, PA., Sept. 16 — The Hench & Drongold Co., this city, large manufacturer of garden implements, has entered the automobile field as maker of wood work of all kinds for automobiles and trucks, including bodies and parts of both wood and metal. The company will also build special machinery and do machine and forge work. Special equipment has been installed in the company's large new plant, which covers about 6 acres.

### Van Dorn Tool Doubles Capacity

CLEVELAND, OHIO, Sept. 15—The new plant of the Van Dorn Electric Tool Co., located on the heights above Cleveland has doubled the output of the company. The new building is three stories and is of steel, brick and concrete. It is located on a spur of the Cleveland Belt Line.

### American Chain Salesmen Inspect New Bridgeport Plant

BRIDGEPORT, CONN., Sept. 15—At a convention of American Chain salesmen held recently, a thorough inspection was made by the men of the new plant which is being erected here. This will double the capacity of the Weed concern, as it includes 50,000 sq. ft. of floorspace. The roof is just being closed on one of a group of six buildings and a duplicate of this five-story building will be completed in 30 days.

### Continental Begins Another Addition

MUSKEGON, MICH., Sept. 13—The Continental Motor Co. has begun work on the erection of a new automatic screw machine factory building, which will be one story high and of the saw-tooth roof style. When this building is completed the automatic screw machine department, which is now located on the third floor of the L factory building, will be moved into the new plant.

### Kelly-Springfield May Move

AKRON, OHIO, Sept. 18—The Kelly-Springfield Tire Co. is considering the removal of its plant from this city to Cumberland, Md. If moved, the plant will be tripled in capacity. The Akron plant will be sold for, it is expected, $750,000, and negotiations are under way for the donation by Cumberland of $750,000 and a 75-acre site. The company now employs 1500 men, but in Cumberland would have 3000. Kelly-Springfield is paying $4 a share and earning about $12.

### Maxwell Assembly Plant for Dallas

DALLAS, TEX., Sept. 13—The Maxwell Motor Car Co., Detroit, Mich., has purchased a site for an assembling plant to be the distributing point for five States. The Dallas plant will be the third of its kind to be erected by the company.

### Master Calorite Plugs Adopted by P. O.

HARTFORD, CONN., Sept. 16—The postmaster general has awarded to the Hartford Machine Screw Co., manufacturer of master calorite spark plugs, the contract for the Postal Service.

# Waukesha Motor To Expand

## Increases Capital from $200,000 to $1,000,000—Adds to Plant Facilities

WAUKESHA, WIS., Sept. 16—The Waukesha Motor Co., Waukesha, Wis., manufacturer of motor car, truck and tractor motors, has increased its capital stock from $200,000 to $1,000,000 to provide for extensions to its plant. Work on a new office building is now under way, and plans are being prepared for large extensions of the machine shop, assembly department, and testing shop. The company has been obliged to decline acceptance of numerous large orders for engines because its facilities already are being pushed to the utmost by the orders now being executed.

### Harroun Motors Buys Plant

DETROIT, MICH., Sept. 18—The Harroun Motors Corp., in which Ray Harroun is a principal, has bought the Prouty & Glass Carriage Co. plant at Wayne, and will begin the manufacture of a car designed by Harroun, as announced in THE AUTOMOBILE last week. First models were built in the Dodge Power Building. The car will be sold for less than $600.

### Bosch Magneto Co. Adds Again

SPRINGFIELD, MASS., Sept. 16—The recent addition to the local works of the Bosch Magneto Co. is to be further augmented by an addition providing more than 60,000 sq. ft. Ground has already been broken for the new building, and it will be rushed to completion.

The addition is to be a single-story building, with saw-tooth roof providing maximum light and ventilation.

When this second addition has been completed there will have been more than 130,000 sq. ft. added to the Bosch works during 1916.

### Maxwell Plant for Dallas

DALLAS, TEX., Sept. 16—The Maxwell Motor Car Co. has purchased a site for an assembly plant here, which will be the distributing point for five States. The plant is the third of its kind in the United States.

### Brunswick-Balke Tire Plant Contracts Awarded—Plan Dwellings

MUSKEGON, MICH., Sept. 11—Construction work on the automobile tire factory of the Brunswick Balke-Collender Co. will be started soon, the contract for the building having been awarded. The

structure will cost $40,000 to $50,000, and will have 40,000 sq. ft. of floor space. It is to be ready for occupancy within sixty days.

In order to provide for the increase in the number of its employees, the Brunswick company has also contracted for the erection of about thirty double dwellings, to be occupied only by its own workers.

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**Loewe Is Brunswick-Balke Mgr.**

MUSKEGON, MICH., Sept. 18—F. J. Loewe has been appointed general manager of the Brunswick-Balke-Collender Co., billiard and bowling alley fixture maker, which entered the automobile tire manufacturing field last April. For the benefit of its workmen the company has started construction work on a large number of double houses.

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**Russell Resigns from Bessemer**

GROVE CITY, PA., Sept. 16—R. F. Russell has resigned as production engineer of the Bessemer Motor Truck Co. to become identified with the Air Reduction Co. in New York. Mr. Russell has been connected with the Bessemer for the past 3 years.

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**Taylor Joins Evapco Co.**

DETROIT, MICH., Sept. 16—Kirk Taylor has been appointed sales and advertising manager of the Evapco Mfg. Co., this city, succeeding W. O. Seelye. Taylor was formerly assistant manager for the New Era Spring & Specialty Co. The Evapco company hereafter will sell only to jobbers.

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**Millar, of Auto Parts Mfg. Co., Dies**

MILWAUKEE, WIS., Sept. 16—James D. Millar, secretary and treasurer of the Auto Parts Mfg. Co., Milwaukee, died of apoplexy this week, aged 62 years.

# Imperial Brass Co. Expands

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## Will Have 150,000 Sq. Ft. After Additions Are Completed—24 Hr. Schedule

CHICAGO, ILL., Sept. 18—The Imperial Brass Mfg. Co., this city, will begin next week the construction of an addition to its factory which will double its floor space. The present building contains 75,000 sq. ft. and the addition will contain an equal area, giving a total of 150,000 sq. ft. The new foundry space will more than double the present foundry space. Like the present plant, the new building will be of heavy mill construction and will be erected on an adjoining site at Harrison Street and Racine Avenue. Bids are now being taken for the building work. Orders have been placed for the new factory equipment.

The company's plant has been running night and day for several months without doing any war business.

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**Ford Distributes $850,000**

DETROIT, MICH., Sept. 18—The Ford Motor Co. has distributed $850,000 as bonuses among 1399 heads of departments, superintendents, foremen, and other employees, in sums of $100 and up. This is $120,000 greater than the 1915 bonus.

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**Tobin with Cutting, Armstrong & Smith**

DETROIT, MICH., Sept. 16—F. D. Tobin, assistant district manager of the Willard Storage Battery Co., Detroit, has resigned to become affiliated with the Cutting, Armstrong & Smith Sales Co.

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**Iowa Rubber Plant in Bettendrof**

DAVENPORT, IOWA, Sept. 16—The Iowa Rubber Tire Co., recently organized, will locate its plant in Bettendrof, a suburb of Davenport. A tract of 10 acres has been purchased, and an option secured upon an adjacent tract of similar size. It was necessary to locate the plant close to the Mississippi River, as 200,000 gallons of water will be consumed daily in the various processes of manufacturing tires. Ground will be broken on Nov. 1. An initial order for $100,000 worth of machinery has been placed. C. H. Roth, who recently resigned as vice-president of the American Tire and Rubber Co., has arrived in Davenport to take active charge of the department of sales of the new concern.

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**McQuay-Norris Men Promoted**

ST. LOUIS, MO., Sept. 18—The McQuay-Norris Mfg. Co. has made the following promotions in its selling force: Frank J. Stanley of the traveling force is made manager of the Cincinnati branch; Howard W. Sweeney is made manager of the Denver branch.

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**Stockbridge Heads N. E. Winton**

LONDON, ENGLAND, Aug. 26—Ball and Motor Car Co. of Cleveland has sent Frank W. Stockbridge to Boston to become manager of the New England branch on Commonwealth Avenue. He succeeds F. A. Hinchcliffe, who has taken the agency for the Jordan car.

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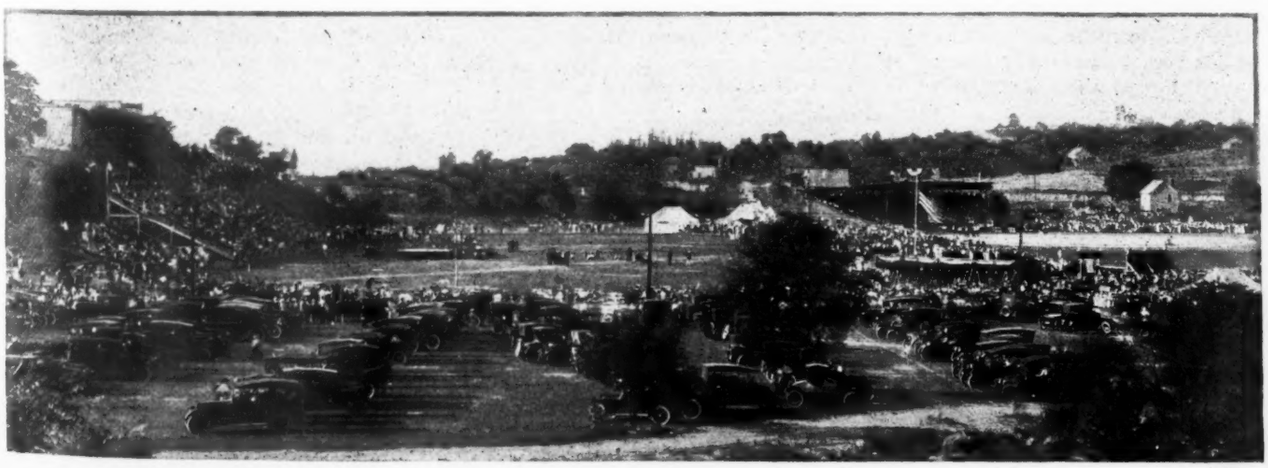
**Wizard Parts Co. Formed**

BAY CITY, MICH., Sept. 15—The Wizard Auto Parts Mfg. Co. was recently organized here to manufacture a new steering device for Ford and other cars, invented by L. J. Weatherwax. It is said that several automobile manufacturers after having investigated the merit of the new invention have made propositions to Mr. Weatherwax for exclusive rights to use the device. Mr. Weatherwax is president of the company; C. J. Scheurmann is vice-president; F. B. Scheurmann, secretary-treasurer.



Seiberling Field, Akron, Ohio, as it appeared Labor Day on the occasion of the field and track meet held by the Goodyear Tire and Rubber Co. This athletic carnival is said to be the largest ever held by a private corporation

# Hydraulic Pfd. Issue $1,000,000

## Pressed Steel Co. Plans to Retire Present Issue of $200,000

CLEVELAND, OHIO, Sept. 16—The Hydraulic Pressed Steel Co., this city, has issued $1,000,000 7 per cent cumulative preferred stock, which has been purchased by Borton & Borton. J. H. Foster, vice-president and general manager of the company, states that the new capital will be used in extending and developing the company's business, it being proposed to retire the present preferred issue of $200,000, which is callable at 102½. A sinking fund will be established Jan. 1, 1917, and each year thereafter $50,000 worth of the new stock will be retired. The stock will be callable at 107½. The company will not be sold.

Total net assets of the company will show an excess of three times the new preferred stock issue, and the net quick assets about one and one-half times. The earnings of the company for the past 2 years have averaged four times the dividend requirements of the new preferred issue. The subscription price has not yet been set.

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### General Bearings Corp. to Take Over Standard Roller

PHILADELPHIA, PA., Sept. 16 — The General Bearings Corp. is about to be organized here to take over the business of the Standard Roller Bearing Co., this city, which has been in the hands of receivers for 3 years. No information as to the personnel of the new company is ready for publication, but it was stated that the capital stock will be about $5,000,000.

The receivers, R. S. Woodward, Jr., and S. Laurence Bodine, are preparing their report to be submitted to the United States District Court in this city for approval. In the meantime an application has been made for the renewal of the present license which was granted by the Hess-Bright Corp., holder of the Conrad patents for ball bearings, and which is about to expire. The renewal is being asked for as a matter of protection to the new company and will be considered by the court.

The plans for reorganization, it was said, will allow the present stockholders to participate by paying an assessment of $7.50 on each share of common stock and $15 on each share of preferred.

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### $40,000 Co. to Make Visible-Measure Gasoline Dispenser

LOUISVILLE, KY., Sept. 16—The Visible Measure Gasoline Dispenser Co. has been incorporated here to manufacture, sell, install, rent and lease the Visible Measure Gasoline Dispenser. The capital stock of the company is $40,000, divided into 4000 shares of $10 each, and the limit of indebtedness which may be incurred is $10,000.

Incorporators and their holdings are: J. Henry Brady, 3000 shares; William A. Earl and William A. Pell, 10 shares each.

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### Materials Market Holds Steady

NEW YORK CITY, Sept. 20—Tin and cottonseed oil showed the greatest changes in the materials market quotations during the past week. Both were up, cotton seed oil by 58 cents per barrel and tin by 50 cents a 100 lb. Lead also increased so that it has now attained a level of 7 cents per pound. Lard oil left the dollar mark and ascended to $1.08. No drops in prices are to be noted in the quotations.

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### Calmont Resigns from Jackson

JACKSON, MICH., Sept. 11—G. C. Calmont, has resigned as advertising manager of the Jackson Automobile Co.

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### Ryan Heads Gibson Branches

INDIANAPOLIS, IND., Sept. 20—The Gibson Co., Indiana Overland distributors, has appointed P. J. Ryan as supervisor of its six branches.

## Daily Market Reports for the Past Week

| Material | Tues. | Wed. | Thur. | Fri. | Sat. | Mon. | Week's Ch'ge |
|---|---|---|---|---|---|---|---|
| Aluminum, lb. | .60 | .61 | .61 | .61 | .61 | .61 | + .01 |
| Antimony, lb. | .11½ | .11½ | .11½ | .11½ | .11½ | .11½ | ... |
| Beams & Channels, 100 lb. | 2.76 | 2.76 | 2.76 | 2.76 | 2.76 | 2.76 | ... |
| Bessemer Steel, ton | 45.00 | 45.00 | 45.00 | 45.00 | 45.00 | 45.00 | ... |
| Copper, Elec., lb. | .28 | .28 | .28 | .28 | .28 | .28 | ... |
| Copper, Lake, lb. | .28 | .28 | .28 | .28 | .28 | .28 | ... |
| Cottonseed Oil, bbl. | 9.75 | 10.10 | 10.04 | 10.20 | 10.25 | 10.28 | + .58 |
| Fish Oil, Menhaden, Brown, gal. | .58 | .58 | .58 | .58 | .58 | .58 | ... |
| Gasoline, Auto, bbl. | .22 | .22 | .22 | .22 | .22 | .22 | ... |
| Lard Oil, prime, gal. | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.08 | + .08 |
| Lead, 100 lb. | 6.70 | 6.80 | 6.80 | 6.90 | 6.90 | 7.00 | + .30 |
| Linseed Oil, gal. | .69 | .69 | .69 | .69 | .69 | .69½ | + .00½ |
| Open-Hearth Steel, ton | 45.00 | 45.00 | 45.00 | 45.00 | 45.00 | 45.00 | ... |
| Petroleum, bbl., Kans., crude | .90 | .90 | .90 | .90 | .90 | .90 | ... |
| Petrolcum, bbl., Pa., crude | 2.30 | 2.30 | 2.30 | 2.30 | 2.30 | 2.30 | ... |
| Rapeseed Oil, refined, gal. | .90 | .90 | .90 | .90 | .90 | .90 | ... |
| Rubber, Fine Up-River Para, lb. | .72 | .72 | .72 | .72 | .72 | .72 | ... |
| Rubber, Ceylon, First Latex, lb. | .58½ | .58½ | .58½ | .60 | .60½ | .61½ | + .04½ |
| Sulphuric Acid, 60 Baume, gal. | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | ... |
| Tin, 100 lb. | 38.50 | 38.37½ | 38.50 | 38.50 | 38.50 | 38.50 | + .50 |
| Tire Scrap, lb. | .05⅜ | .05⅜ | .05⅜ | .05¾ | .05¾ | .05¾ | + .00⅜ |

# Fuller Ouput Worth $700,000

## Parts Manufacturing Concern Has Record Year—New Plant Is Planned

KALAMAZOO, MICH., Sept. 12—This has been the biggest year in the history of the Fuller & Sons Mfg. Co. The value of the output of automobile parts for the fiscal year 1916 as given by the officials is $700,000, as compared with $225,000 in 1915 and $75,000 in 1914. The working force, which was about fifty men in 1915, ran up to 225, and even 250 at times, during the present year. By 1918 the concern expects to have a new plant of more than twice the size of its present premises.

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### Ellis-Smith Replaces Rub-On

BUFFALO, N. Y., Sept. 16—The Ellis-Smith Mfg. Co., Inc., is the new name of the Rub-On Mfg. Co., Inc. The change became effective Sept. 1. The management and sales policy of the company remain the same.

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### Portage Rubber Raises Dividend to 10 Per Cent

BARBERTON, OHIO, Sept. 16—Directors of the Portage Rubber Co., this city, have placed the stock on a 10 per cent yearly basis by declaring a quarterly dividend for a time of 2½ per cent of the common, payable to stock of record Nov. 3.

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### Dividends Declared

Gray & Davis, Inc., quarterly dividend of 1¾ per cent on preferred, payable Oct. 1.

Springfield Body Corp., quarterly dividend of 2 per cent on preferred, payable Oct. 1, to stock of record Sept. 21.

Wilson & Co., Inc., quarterly dividend of 1¾ per cent on preferred, payable Oct. 2, to stock of record Sept. 20.

Stutz Motor Car Co., 2½ per cent on common, 1½ per cent on second preferred, and 1¾ per cent on third preferred, payable Oct. 2 to stock of record Sept. 15.

Billings & Spencer Co., Hartford, Conn., quarterly of 2 per cent, and an extra dividend of 3 per cent payable on Oct. 2.

Allis-Chalmers Mfg. Co., quarterly of 1½ per cent on preferred, payable Oct. 16 to stock of record Sept. 30.

Texas Co., quarterly of 2½ per cent, payable Sept. 30 to stock of record Sept. 15.

Saxon Motor Car Corp., quarterly of 1¾ per cent, payable Oct. 2 to stock of record Sept. 29.

# G. M. C. Common Up $120 in Week

## Market Strong in Many Issues —Chevrolet Increase $18 and Firestone $25

NEW YORK CITY, Sept. 19—General Motors common still remains the feature of the market with a net increase of $120 per share during the last week. This makes a rise of $155 in 3 weeks and is not only a new high mark for the issue itself but sets a record for the New York Stock Exchange, with one exception which is the sale of Northern Pacific at $1,000 per share during the panic of 1901.

Firestone came back during the week. It was off $30 a week ago, but its increase of $25 brings it back to $1,015 bid and $1,030 asked. Another rubber stock to show an advance was Miller which is now up to $265, an increase of $27 a share during the week. The other tire and rubber stocks remained quite firm with little fluctuation as compared with the more active stocks. Chevrolet, which was quite steady last week, took another forward move and increased $18 a share so that the closing price yesterday was $213.

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### Scripps-Booth Elects Directors

NEW YORK CITY, Sept. 18—The board of directors of the Scripps-Booth Corp., which was recently formed to acquire and operate the Scripps-Booth Co. and the Sterling Motor Co., of Detroit, is made up of the following: C. H. Booth, president; W. H. Little, N. J. Miller, W. L. Scripps, F. J. Sesenbrenner, Alfred P. Sloan, Jr., and T. P. Warner.

Up to the present time the production of Scripps-Booth cars has reached approximately 6000, about one-third of which has been sold in foreign markets.

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### Saxon and Stutz Stock on 'Change

NEW YORK CITY, Sept. 16—Stocks of the Saxon Motor Car Co., Detroit, Mich., and the Stutz Motor Car Co., Indianapolis, Ind., have been listed on the New York Stock Exchange, and will be traded in in a few days, or as soon as the permanent certificates are ready. The new stock of the General Motors Co. is being actively traded in on the Broad Street curb "when, as and if issued." Since Monday last the stock has advanced some 35 points.

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### Grant Earns $78,000 in August

CLEVELAND, OHIO, Sept. 16—Net earnings of the Grant Motor Co. in August amounted to $78,000. This is at the rate of 40 per cent on the common stock after paying the dividend on the preferred.

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### Gasoline 1 Cent Lower in Ohio

COLUMBUS, OHIO, Sept. 16—The price of gasoline in Columbus and central Ohio territory has been reduced from 22 to 21 cents per gallon. It is expected that the price will be still farther reduced in the near future.

# Ky. Crops to Boost Car Sales

## Corn Yield Expected to Equal 1915 Record—Tobacco and Hay Do Well

LOUISVILLE, KY., Sept. 16—Kentucky automobile manufacturers, distributers, dealers and factory representatives are elated over the latest report of the United States Department of Agriculture, forecasting for the State a corn crop of more than 114,000,000 bushels, which is equal to the crop of 1915, the largest ever raised in the State; a tobacco crop of 472,000,000 lb., which is 115,000,000 lb. larger than the crop of last year, and is a new high record, and a hay crop of 1,240,000 tons, an increase of 15,000 tons over 1915, and also a new high record. Crops falling short of 1915 include wheat, with an estimated production of 8,190,000 bushels as compared with 9,900,000 bushels in 1915; oats with a yield of 4,540,000 bushels, a decrease of 920,000 bushels from 1915, and apples, with a yield of 2,470,000 barrels as compared with 4,170,000 barrels in 1915. The large crops of corn, tobacco and hay more than offset the decreases in the other crops and the sharply advanced prices for all farm products give the crops of the State a substantially higher value than the crops of 1915.

This means prosperity in the Blue Grass State, and there is no question but what big corn, tobacco and hay crops

## Automobile Securities Quotations on the New York and Detroit Exchanges

| | 1915 Bid | 1915 Asked | 1916 Bid | 1916 Asked | Wk's Ch'ge |
|---|---|---|---|---|---|
| Ajax Rubber Co. | .. | .. | 65½ | 58 | +3 |
| J. I. Case T. M. Co. pfd. | 78 | 84 | 81¾ | 84 | —1¾ |
| Chalmers Motor Co. com. | 109 | 111 | 158 | 164 | +13 |
| Chalmers Motor Co. pfd. | 96 | 99 | 97 | 100 | +2 |
| *Chandler Motor Car Co. | .. | .. | 105 | †106 | —3 |
| Chevrolet Motor Co. | .. | .. | 208 | 213 | +18 |
| Fisher Body Corp. | .. | .. | 40¼ | 41 | .. |
| Fisk Rubber Co. com. | .. | .. | 97 | 106 | —2 |
| Fisk Rubber Co. 1st pfd. | .. | .. | 110 | 114 | +3 |
| Fisk Rubber Co. 2d pfd. | .. | .. | 101 | 110 | +1 |
| Firestone Tire & Rubber Co. com. | 525 | 535 | 1015 | 1030 | +25 |
| Firestone Tire & Rubber Co. pfd. | 111 | .. | 110 | 112 | .. |
| *General Motors Co. com. | 286 | 290 | 680 | 740 | +120 |
| *General Motors Co. pfd. | 114 | 115 | 126¼ | 127 | + ¾ |
| *B. F. Goodrich Co. com. | 65½ | 67 | 72⅛ | 72½ | + ⅛ |
| *B. F. Goodrich Co. pfd. | 108 | 110 | 113½ | 113⅞ | + ⅜ |
| Goodyear Tire & Rubber Co. com. | 295 | 300 | 248 | 252 | +1 |
| Goodyear Tire & Rubber Co. pfd. | 108½ | 109½ | 108 | 109 | + ¾ |
| Grant Motor Car Corp. | .. | .. | 7 | 8 | .. |
| Hupp Motor Car Corp. com. | .. | .. | 6¼ | 6¾ | + ¼ |
| Hupp Motor Car Corp. pfd. | .. | .. | 80 | 100 | .. |
| International Motor Co. com. | 29 | 31 | 6 | 10 | .. |
| International Motor Co. pfd. | 61 | 65 | 15 | 20 | .. |
| *Kelly-Springfield Tire Co. com. | 210 | 213 | 82⅜ | 82¾ | — ⅜ |
| *Kelly-Springfield Tire Co. 1st pfd. | 88 | 90 | 98 | 100 | —1 |
| *Lee Rubber & Tire Corp. | .. | .. | 46 | 48 | —1½ |
| *Maxwell Motor Co. com. | 45½ | 47 | 91½ | 91¾ | +9⅞ |
| *Maxwell Motor Co. 1st pfd. | 89 | 90 | 85⅝ | 86⅝ | +2⅛ |
| *Maxwell Motor Co. 2d pfd. | 37 | 38½ | 55 | 56 | +2½ |
| Miller Rubber Co. com. | 190 | 195 | 250 | 265 | +27 |
| Miller Rubber Co. pfd. | 107 | 109 | 104 | 106 | .. |
| Packard Motor Car Co. com. | 120 | 130 | 164 | 173 | —1 |
| Packard Motor Car Co. pfd. | 93 | 94 | 97 | 101 | .. |
| Paige-Detroit Motor Car Co. | .. | .. | 30 | 34 | —23 |
| Peerless Truck & Motor Corp. | .. | .. | 26 | 27 | +2½ |
| Portage Rubber Co. com. | 55 | 59 | 160 | 164 | +8 |
| Portage Rubber Co. pfd. | 93 | 94 | 160 | 165 | +10 |
| Regal Motor Car Co. pfd. | .. | .. | 17 | 22 | +3 |
| Reo Motor Truck Co. | .. | 17½ | 43½ | 44 | — ½ |
| Reo Motor Car Co. | 33 | 34 | 43½ | 44 | — ½ |
| Saxon Motor Car Corp. | .. | .. | 75 | 82 | +3 |
| Springfield Body Corp. com. | .. | .. | 84 | 89 | .. |
| Springfield Body Corp. pfd. | .. | .. | 120 | 130 | .. |
| Standard Motor Construction Co. | .. | .. | 6 | 7 | .. |
| Stewart-Warner Speed. Corp. com. | 66½ | 67½ | 113 | 114 | —1 |
| Stewart-Warner Speed. Corp. pfd. | 105 | 107 | .. | .. | .. |
| *Studebaker Corp. com. | 128½ | 130 | 129¾ | 130¼ | +5⅞ |
| *Studebaker Corp. pfd. | 106 | 107 | 109 | 111 | .. |
| Swinehart Tire & Rubber Co. | 86 | 90 | 99 | 101 | +7 |
| United Motors Corp. | .. | .. | 66 | 67 | +4⅝ |
| *U. S. Rubber Co. com. | 51½ | 53 | 59½ | 59⅝ | +1½ |
| *U. S. Rubber Co. pfd. | 104 | 106 | 114 | 115 | +2¾ |
| White Motor Co. | 110 | .. | 55 | 55½ | +2 |
| *Willys-Overland Co. com. | 192 | 194 | 47⅜ | 47½ | — ⅝ |
| *Willys Overland Co. pfd. | 105½ | 108 | 104¼ | 105 | +1 |

*At close Sept. 18, 1916—Listed New York Stock Exchange. †Ex.-Div. Quotations by John Burnham & Co.

### OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

| | 1915 Bid | 1915 Asked | 1916 Bid | 1916 Asked | Wk's Ch'ge |
|---|---|---|---|---|---|
| Auto Body Co. | .. | .. | 39 | 41½ | +2¼ |
| Chalmers Motor Co. com. | 110 | 115 | 165 | 173 | .. |
| Chalmers Motor Co. pfd. | 97¼ | 99 | .. | 102 | .. |
| Continental Motor Co. com. | .. | 295 | 38¼ | 40 | +3¼ |
| Continental Motor Co. pfd. | 85 | 90 | 9½ | 10½ | .. |
| Ford Motor Co. of Canada | .. | 1535 | 320 | .. | +15 |
| General Motors Co. com. | 285 | 295 | 725 | .. | +80 |
| General Motors Co. pfd. | 114 | 118 | 126 | 129 | .. |
| Maxwell Motor Co. com. | 44 | 46 | 87½ | 90½ | +4 |
| Maxwell Motor Co. 1st pfd. | 88 | 90 | 86 | 89 | +1½ |
| Maxwell Motor Co. 2d pfd. | 36 | 39 | 53 | 57 | +2 |
| Packard Motor Car Co. com. | 120 | 130 | 163 | 168½ | —2 |
| Packard Motor Car Co. pfd. | 100 | .. | .. | 102 | .. |
| Paige-Detroit Motor Car Co. | .. | 450 | 31 | 34 | —18 |
| W. K. Prudden Co. | 20½ | 22 | 41½ | .. | —2½ |
| Reo Motor Car Co. | 33¾ | 34¼ | 43¾ | 45 | — ¾ |
| Reo Motor Truck Co. | 16⅞ | 17⅝ | 42½ | 44 | —2⅛ |
| Studebaker Corp. com. | 120 | 125 | 128½ | 131½ | +6½ |
| Studebaker Corp. pfd. | 105 | 109 | 105 | .. | .. |
| C. M. Hall Lamp Co. | .. | .. | 25½ | .. | + ½ |

INACTIVE STOCKS

| | | | | | |
|---|---|---|---|---|---|
| Atlas Drop Forge Co. | .. | 31 | 35 | .. | .. |
| Kelsey Wheel Co. | 205 | .. | 55 | 60 | .. |
| Regal Motor Car Co. pfd. | .. | 21 | 18 | .. | .. |

will result in a greater demand for cars. Farmers and people out in the rural districts are buying more machines than ever before.

It is pointed out by local automobile men that in a crop year marked by extreme fickleness of weather, from which the country as a whole has suffered severe losses in the principal crops, Kentucky has been conspicuously fortunate.

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**Skinner a Manufacturers' Representative**

NEW YORK CITY, Sept. 16 — Kenneth Skinner has resigned as secretary of the Micro Piston Ring Co., this city, having sold his interest in the concern. Mr. Skinner has gone into business as a manufacturers' representative under the firm name Auto Appliance Co., 1960 Broadway, where he represents the G. H. Dyer Co., Cambridge, Mass., and the Asbestos & Rubber Works of New Jersey, Camden, N. J. The Auto Appliance Co. is also planning other connections.

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**Electric Charging Station in Melbourne**

MELBOURNE, AUSTRALIA, Aug. 26.—The municipal electric supply department in this city will open a charging station for electric vehicles at its power house on Spencer Street. This station will be open day and night. The cost of current for charging will be 2 cents per unit between the hours of 10 p. m. and 8 a. m., and during other hours will be 3½ cents per unit. A charge of $2.43 per vehicle per week will be made for accommodation.

The absence of electric vehicles from the streets of Melbourne is largely due to the lack of charging stations, and the establishment of the above station will do much to create a demand for American electric vehicles of all kinds.

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**Barley Cars Painted to Suit Buyer**

STREATOR, ILL., Sept. 16—The Barley Automobile Mfg. Co., Streator, has decided to paint all of the cars manufactured in the future in accordance with the wishes of the buyers. A lengthy list of color combinations has been prepared which is submitted to patrons.

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**Cleveland Dealers to Protect Buyers**

CLEVELAND, OHIO, Sept. 16—Cleveland dealers have formed an association for the protection of automobile buyers, offering a uniform service policy. This policy will insure to the purchaser the service to which he is entitled, a strict fulfillment of the manufacturer's guarantee, inspection and adjustment.

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**Ceylon Import Duty Increased**

COLOMBO, CEYLON, Aug. 20—The duty on automobiles, excluding trucks, imported into this country has been increased to 33 1/3 per cent ad valorem, the increase being effective Aug. 2. The former rate on automobiles was 5½ per cent ad valorem.

# May Revive Hoosier 500-Mile

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## Proposed Increase of Purse to $50,000 May Mean Longer Distance

INDIANAPOLIS, IND., Sept. 16—It is expected that the Indianapolis Speedway will ask a sanction for a race of 500 miles with a purse of $50,000 to be held next Decoration Day. The original speedway contest was for this distance, but it was reduced to 300 because of the seeming unpopularity of the longer event.

Some time ago the speedway managers agreed not to offer more than $100 per mile and since a purse of $50,000 is being considered by the Indianapolis management, it necessarily follows that the distance must be increased if the $100 per mile agreement is to be kept.

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**22 Entries for Astor Cup**

NEW YORK CITY, Sept. 19—Twenty-two entries have been received so far for the Astor Cup Race which will be held on the Sheepshead Bay track on Sept. 30. The entries are:

| Car | Driver | Car | Driver |
|---|---|---|---|
| Crawford | Moore | Sunbeam | Christaens |
| Crawford | Klein | Sunbeam | Chevrolet |
| Crawford | Chandler | Deusenberg | Milton |
| Kleinart | Unnamed | Deusenberg | D'Alene |
| Delage | Franchi | Mercer | Pullen |
| Delage | Devigne | Mercer | Ruckstell |
| Dans L'Argent | Muller | Deusenberg | Buzane |
| Deusenberg | Devlin | Blue Bird | Unnamed |
| Peugeot | Resta | K. W. P. Sp. | Packard |
| Hudson | Vail | Olsen | Unnamed |
| Adams Sp. | Adams | Olsen | Unnamed |

In addition the management expects further entries which will bring the list up to thirty-two.

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**Speedway Men Meet Sept. 29**

NEW YORK CITY, Sept. 18—Representatives of speedways in Tacoma, Indianapolis, Chicago, New York, Cincinnati, Providence, Des Moines, Omaha, Kansas City and Sioux City will meet in this city Sept. 29 to fix the speedway racing dates for 1917. Some of these tracks are represented by three or four men, which brings the gathering up to twenty-five or thirty.

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**Returned Soldiers to Build Roads**

TORONTO, ONT., Sept. 16—The Dominion Military Hospitals Commissions, which met in Toronto, to-day, under the presidency of Senator Lougheed, adopted resolutions advocating the building of a national highway by the Federal Government and the promulgation of a comprehensive land settlement policy for returned soldiers. The first resolution set forth: That as a considerable number of the men who have enlisted and are at present overseas or about to proceed thither, are unskilled laborers for whom it may be difficult to provide employment immediately on their return, the commission advocates the building of a national highway by the Federal Government. It would respectfully submit to the government that such an undertaking would be a work of the greatest value. Among the advantages would be:

1. Temporary employment would be provided for thousands of men who would not otherwise find work.
2. No public would provide so large an amount of employment at so small a capital outlay.
3. The highway would be of immense value as a means for the transit of agricultural and other produce.
4. It would be the means of attracting numbers of tourists, entailing the spending of money within the borders of Canada.
5. It would solve the problem of demobilization, as it would allow of a gradual disbanding of the troops from coast to coast.
6. It would be a most practical memorial to Canada's part in the great war.

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**Bearings on British Embargo List**

LONDON, ENGLAND, Aug. 26—Ball and roller bearings and steel balls and rollers for bearings have been added to the British list of goods the exportation of which is prohibited to all destinations.

Spark plugs have also been included in the embargo list but these are prohibited from being exported to all foreign countries in Europe and on the Mediterranean and Black Seas, other than France, Russia (except through Baltic ports), Italy, Spain and Portugal.

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**Illinois Dealers Must Use Number Plates on Demonstrators**

BLOOMINGTON, ILL., Sept. 16—Illinois automobile dealers must attach a license plate to every car used for demonstrating purposes, or which are otherwise engaged for commercial purposes. This announcement was made by Ben Cochrane, State examiner for chauffeurs who is now going over the State, issuing licenses to all drivers. In some cities, the dealers have purchased one license and utilized but the single plate. The courts have ruled that one license is sufficient but each car must carry a number. The duplicate plates will be furnished by the Secretary of State for their exact cost. Each dealer is being notified of the requirements of the law, and the authorities in each city have been directed to see that all dealers respect it.

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**400,000 Cars in Iowa?**

DES MOINES, IOWA, Sept. 16—Iowa will have 400,000 automobiles, or one for every six persons in the State, according to the prophecy of W. D. Wilwerscheid of St. Paul, Minn., who manufactures automobile number plates. The registration for this year is already 190,000, and the total is expected to exceed 200,000 before the end of the present year.

# 84,000 See Show at Milwaukee

## State Fair Included 202 Gasoline Cars, 2 Electrics and 14 Trucks

MILWAUKEE, WIS., Sept. 16—More people saw the second annual motor show of the Milwaukee Automobile Dealers, Inc., at State Fair park this week than visited the Milwaukee Auditorium show last January. Nearly 84,000 people paid 10 cents to see the Wisconsin State Fair automobile show of 1916. In all, nearly 100,000 people were admitted to the concrete automobile building. The official attendance at the fair for the week was 172,500, indicating that approximately one-half of the total number of visitors to the fair paid to see the show, and more than two-thirds of the persons who entered the big fair park actually saw it.

A total of 202 passenger cars; two electric cars; fourteen motor trucks, and thirty-one accessory exhibits were crowded into Automobile Hall this year.

Dealers of note from many parts of the country came to Milwaukee this week to inspect the exposition and get a line on the reasons for the great success achieved by the Milwaukee dealers' association in conducting a show at a State fair. Since the motor car became a factor, it has been exhibited at State and county fairs, generally under canvas, or in an open shed, not far from cattle and sheep, or in some corner of the fair grounds not needed for something else. It was the same at the Wisconsin State fair until 1915, when the M. A. D. leased a great concrete, shed-like "Machinery Hall," spent several thousand dollars in walling in the four sides with steel and glass, and leased out space to its members and other tradesmen on the same basis as it did for the annual show held in the Auditorium.

When the fair was over and the show closed its doors, there was enough left from the small admission charge so that every member of the association could receive a percentage return on his expense. Not only that, but every exhibitor was more than satisfied that his expenditure was well worth while on the basis of sales actually made and agencies actually placed.

Although not scheduled to open until Monday, Sept. 11, at 10:30 a. m., the show was ready for inspection at 2 o'clock Sunday afternoon. This year's fair was a 7-day event, instead of running only 5 days, as in former years.

### $3,200 for Roads

On Wednesday, which was State and Good Roads day, the M. A. D., as previously pledged, turned over the entire receipts of the show to the Good Roads Association of Wisconsin, to further highway improvement propaganda. It is said that more than $3,200 was realized in this manner.

The booster tour took care of practically all the advance work of the association. It called the attention of from 750,000 to 1,000,000 people to the State fair automobile show.

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### 30,000 Automobiles at Iowa Fair

DES MOINES, IOWA, Sept. 16—Over 30,000 automobiles, valued at about $200,000,000, passed through the gates of the Iowa State Fair during the 10 days of that recent event. Over 5000 cars entered the grounds daily on several of the big days of the fair, and ten men were working at top speed to take care of the car entrances during the rush hours. The fair this year, with a total attendance of over 300,000, was the greatest in the history of the State.

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### Car Show Building at Brockton

BROCKTON, MASS., Sept. 18—A $25,000 automobile exhibition hall is to be erected on the Brockton Fair Grounds. It will have display space for 108 cars, and will be completed the latter part of September. It will be 200 by 125 ft., with only two rows of posts, and will be electrically lighted.


Automobile Hall, in which the Milwaukee dealers held their exhibit at the State Fair

# Giant's Despair Climb Oct. 7

## A. A. A. Sanctions Revival of Classic—Eleven Events Based on Car Prices

WILKES-BARRE, PA., Sept. 18—The Giant's Despair Hill Climb will be held Oct. 7, according to the A. A. A. sanction.

The events are based upon the selling price of the cars entered, and are: 1, under $800; 2, under $1,200; 3, under $1,600; 4, under $2,000; 5, under $3,000; and 6, under $6,000; 7, Class E, non-stock, open to Class C cars with less than 230 in. displacement; 8, Class C, non-stock, division 6C, 231 to 300 in.; 9, Class C, free-for-all; 10, members of the Wilkes-Barre Auto Club, cars costing under $1,600; and 11, cars owned by members of the Wilkes-Barre Club, costing more than $1,600.

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### Omaha to Have Closed Car Salon in October

OMAHA, NEB., Sept. 20—A distinctly new departure is the closed automobile salon, first to be held in the country at Omaha during the latter part of October, and intended to become an annual event, the same as the regular automobile show, usually held in February, with which it will not conflict. It will be held in the main aisle of the main Brandeis Stores building, and will include the display of some forty closed cars.

If possible the salon will be kept open during the evening. It is planned to continue it for 3 days. Arrangements are in charge of a committee of three, headed by Clarke G. Powell.

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### N. Y. C. Sets Aside Parking Space, Due to Strike

NEW YORK CITY, Sept. 16 — Special parking space has been provided in downtown New York for the large numbers of automobiles now being used by business men in reaching their offices, owing to the lack of transportation facilities caused by the traction strike. The following spaces have been set aside to meet these temporary conditions:

State Street, around park curb.
Battery Place, up to park curb.
Wall Street, Pearl to South Street, one line in center of street.
Burling Slip, Water to South Street, one line in center of street.
West Street, Rector to Cortlandt Street, two lines along outer edge of marginal way.
West Street, Christopher to Gansevoort, two lines along outer edge of marginal way.
Twelfth Avenue, Twenty-fourth to Thirtieth Street, two lines along outer edge of marginal way.
Fifty-seventh Street, Eighth to Eleventh Avenue, two lines in center of street.
Fourteenth Street, Fourth Avenue to Broadway, inside police stanchions on south side of street.
Fourth Avenue, Sixteenth to Seventeenth Street, vehicles to be backed up to west side of park curb.
Fourth Avenue, north of Fourteenth Street, vehicles to be backed up on west side to railing around monument.

# Blevins and Davis in Merger

## $500,000 Deal Combines Studebaker Dealers—New Co. Has Six States

CLEVELAND, OHIO, Sept. 16—The Blevins Auto Sales Co., Toledo and Cincinnati, and the A. R. Davis Motor Co., Cleveland, both Studebaker dealers, have been merged into a new $500,000 company headed by Harry W. Blevins. The company has contracted for $12,000,000 of Studebaker cars and will have the distribution of Studebakers in Ohio and portions of five adjoining States. The company starts with three buildings, in Cleveland, Cincinnati and Toledo. Associated with Blevins, who is president of the new company, are Vice-President A. R. Davis, Cleveland; Treasurer J. O. Hahn and Secretary H. G. Rossiter, Toledo. Davis was at one time branch manager for the Studebaker corporation and up to this time Hahn has been Cleveland branch manager.

### Harry Newman Resigns

CHICAGO, ILL., Sept. 19—Harry Newman, president of Harry Newman, Inc., Chalmers dealers in Chicago, Milwaukee and Springfield has resigned to take a factory position. S. E. Comstock has been made general manager of the Chicago branch. Joseph B. Diebler will control the Milwaukee branch and J. D. Sullivan, Springfield.

### Theft Insurance Rates Raised

BLOOMINGTON, ILL., Sept. 16—Increased rates for insurance against automobile theft have been decided upon by the Western Automobile Underwriters. The lower-priced cars, which are in greater danger of theft, due to difficulty in identification, have been raised from $2.75 to $5. On cars valued at $700 to $1,200 the rate has been increased from $2.25 to $3.50. The rate on cars valued at $1,200 to $2,100, has been raised from $2 to $3, while on the higher-priced cars, the advance has been from $1.75 to $2.

### Capital-to-Capital Car in Detroit

DETROIT, MICH., Sept. 16—The capital-to-capital touring Hupmobile reached this city to-day to pay its respects to the originator of the tour, President J. Walter Drake of the Hupp concern. The party left Lansing, the capital of Michigan, and the sixteenth visited so far by the car, early in the day, and was met just outside of Detroit by a large party of good-roads enthusiasts, who formed a guard of honor, and, escorted by a band, brought the touring car through the downtown streets of the automobile metropolis and out to the Hupp factory. Detroit marks the end of the first division of the long hike. It means that the car has now traveled 3050 miles of the 20,000-mile trip it has undertaken with the intention of visiting every State capital in the interest of good roads. The car left Washington, D. C., the starting point, on Aug. 28.

### Locomobile Holds Fourth Sale

NEW YORK CITY, Sept. 18—The Locomobile Company of America is holding its fourth semi-annual exchange car show and sale this week at its New York branch. The branch salesroom on West Sixty-first Street is devoted entirely to exchanged and rebuilt Locomobiles.

### Ohio to Drive Out Motor Leagues

COLUMBUS, OHIO, Sept. 16—State Insurance Superintendent Frank Taggart declared he would start at once the task of driving out of Ohio all of the motorists' leagues and organizations which sell with their membership psuedo insurance policies which provide, besides membership in the organization, monetary compensation in case of accidents, free legal advice, free legal defense and many other attractive features.

Judge Taggart ruled these organizations are doing an insurance business without complying with the insurance laws of the State, and as such are illegal and their agents are subject to prosecution.

### Arrested as Tire Swindlers

AKRON, OHIO, Sept. 16—Carl F. Geyer, manager of the Double Service Tire & Rubber Co., here, and manager of two other tire concerns, and Ralph C. Harper, assistant manager, were placed under arrest here by Federal authorities on a charge of using the mails to defraud.

Geyer and Harper are charged with doing a fraudulent mail order business, and Federal authorities said they had sold hundreds of defective tires, representing them as standard quality.

The arrests are the result of a year or more of investigation here by Federal officers and automobile clubs of Northern Ohio.

Geyer and Harper also are alleged to have been receiving tires for repair without returning them. They sold stock in the company for 25 cents and guaranteed buyers 80 per cent dividends, according to Federal officers.

### Velie Represented in Australia

MOLINE, ILL., Sept. 16 — The Velie Motor Vehicle Co., this city, has closed with Andrew Robertson, representing Clutterbuck Bros., Sydney, Australia, for representation of the Velie line in that country.

# J. W. Packard a Packard Dealer

## Buys Buffalo Branch of New York Co.—Will Also Handle Liberty

BUFFALO, N. Y., Sept. 18—J. W. Packard, who founded the Packard Motor Car Co., Detroit, Mich., and who gave his name to the car, has re-entered the automobile industry. He has purchased the Buffalo interests of the Packard Motor Car Co. of New York, and will conduct the Buffalo branch as an agency, handling the Packard and the Liberty. Mr. Packard is president of the new business, which is called the Packard Buffalo Motor Co., Inc. B. C. Day, former manager of the branch, is vice-president, and the other directors are: W. D. Packard, capitalist, a brother of the president; E. C. Sutton, president of the Wheat's Ice Cream Co., and L. R. Davidson of the Davidson Ore Mining Co.

The first Packard car was built in Warren, Ohio, by J. W. Packard, in 1899. While the business was still in its infancy Mr. Packard sold his interest to the group which now controls it, and has not been actively connected with the industry since.

The Packard Motor Car Co. of New York has opened a branch in White Plains.

### Iowa Denby Dealers Meet

DES MOINES, IOWA, Sept. 16—Iowa dealers for the Denby Motor Truck were assembled here during State fair week, and at their convention listened to talks by Garvin Denby, president of the company, and W. J. Aitken, sales manager, who came from Chicago for the event. President Denby predicted a big business ahead in Iowa for the motor truck men, both among farmers and merchants.

### Abler Opens Office in N. Y.

NEW YORK CITY, Sept. 18—M. M. Abler, manufacturers' representative, with branches in Amsterdam, Holland, Birmingham, England, and Soerabaya, Java, has opened a New York office at 32 Union Square East. The concern is now representing Studebaker cars, Goodyear tires, the Automobile Supply Mfg. Co., Brooklyn, N. Y., and intends other connections.

### Bearings of Pa. Branch in Chicago

PHILADELPHIA, PA., Sept. 16—The Bearings Co. of Pennsylvania, this city, will open a branch in Chicago. Louis C. Smith, formerly associated with the Class Journal Co. in Chicago, will be manager.

# Factory Miscellany

**Standard Tire Plant Progresses**—The new unit of the plant of the Standard Tire & Rubber Co., Willoughby, Ohio, is almost completed. It contains a power plant sufficient to turn out 1500 to 1800 tires per day. Equipment has been ordered. The company is now bringing out a black tread tire guaranteed to run 3500 miles.

**Atterbury Rebuilds**—Atterbury Motor Car Co., Hertel Avenue, Buffalo, N. Y., is rebuilding its factory recently destroyed by fire. The estimated cost of the new factory is $50,000.

**Tire Plant for Belleville**—Maple Leaf Tires, Ltd., has secured a factory site of 22 acres in Belleville, Ont., and has commenced building operations. The company will employ 100 hands at the start. The main building will be nearly 300 ft. long and of concrete and steel construction. It is intended to rush it toward completion before cold weather sets in. Fifty men are now at work preparing for the foundation.

**Overland Service Plant in Brooklyn**—The Willys-Overland Co. has leased a site 150 by 130 at St. Marks and Underhill Avenues, Brooklyn, N. Y., on which it will erect a service plant. The rental for a period of years is $100,000.

**Hudson Service Plant in N. Y.**—The Hudson Motor Car Co. of New York, Inc., has let the contract for a service station, 203 by 239, four stories, between West Sixty-eighth and West Sixty-ninth Streets and the North River.

**Tom Thumb Tractor Grows**—The Tom Thumb Tractor Co., University and Thirtieth Avenues, S. E., Minneapolis, Minn., plans increasing its facilities to twenty-five tractors per day by April 1, 1917. The plant now makes ten tractors per week and employs about thirty men. This number may be increased to 200.

**Harrow Spring Adds**—The Harrow Spring Co., Kalamazoo, Mich., is to build a large addition to its plant.

**Christensen to Expand**—The Christensen Engineering Co., Milwaukee, Wis., which has increased its capital stock from $300,000 to $1,000,000, will immediately increase its output of the Christensen air-starting mechanism. The starter is generally used on fire department cars, aeroplanes and motor trucks, many having been shipped to Europe in the last 18 months for war purposes. The factory at 841 Thirtieth Street will be enlarged and from 75 to 100 men added to the payroll.

**Boone County Tire Buys Site**—The Boone County Tire and Rubber Co. has been organized and will shortly commence the manufacture of tires at Belvidere, Ill. Ten lots have been purchased in a suburb of that city and plans have been prepared for the necessary buildings. When in operation, the plant will turn out 200 tires per day and will employ from 150 to 200 persons. It is hoped to have the buildings erected and machinery installed by Jan. 1.

**Parker Rust Proof to Build**—The Parker Rust Proof Co., Detroit, Mich., which will manufacture a rust-proof liquid used on motor cars, has purchased a site on Conant Road, in Hamtramck, for a factory, work on which has already been started. It is stated that 700 men will be employed in the plant.

**Big Four Tire Plant**—The Big Four Tire and Rubber Co., Cleveland, Ohio, has purchased as temporary quarters the plant of the Ohio Rubber Co. on the Lake Shore and Big Four tracks at Berea for about $12,000. There are 18,000 sq. ft. of floor space in the plant, which occupies a tract of 5½ acres. The company is moving its machinery into the building and expects to begin manufacturing in about 60 days. The company is to manufacture a patented combination rubber, fabric and steel tire.

**United Smelting's New Mills**—The United Smelting & Aluminum Co., Inc., New Haven, Conn., has opened its new rolling mills in that city. Work is furnished in aluminum sheets, coils, circles, etc., to any specifications.

**Miller Has Factory Paper**—The Miller Rubber Co., Akron, Ohio, is issuing a factory paper entitled "Miller Talk," every one of the 3000 employees being asked to contribute.

**Firestone Opens in Kansas City**—The new branch building of the Firestone Tire and Rubber Company in Kansas City, Mo., was opened Sept. 14, and a dealers' convention was held during the day, which was attended by 500 dealers from various points in the branch territory.

The new building is eight stories high, and contains shop, storage and shopping facilities.

The dealers spent part of the morning inspecting the new quarters and meeting the various Firestone executives from the home office in Akron. The day's events included a group photograph, luncheon, motor parade, business session, in which sales and distribution problems were discussed, and ended with a banquet in the evening.

## The Automobile Calendar

### ASSOCIATIONS

Sept. 25—Indianapolis, Convention for Formation of Indiana Automobile Trade Assn., under auspices of N. A. T. A., Hotel Claypool.

Oct. 2-5—St. Louis, Fall Meeting Assn. of Automobile Accessory Jobbers.

Oct. 2-7 — Kansas City, Mo., Dealers' Show, American Royal Live Stock Show; Kansas City M. C. Dealers' Assn.

Oct. 13—Flint, Mich., Fall Meeting National Assn. of Automobile Accessory Jobbers.

Dec. 2-9—Electricians' Countrywide Celebration.

### CONTESTS

Sept. 29—Trenton, N. J., Inter-State Fair. H. P. Murphy, Racing Sec.

Sept. 30—Astor Cup Race, 250 miles, Sheepshead Bay Speedway, Sheepshead Bay, N. Y.

Oct. 7—Philadelphia Speedway Race.

Oct. 7—Omaha Speedway Race.

Oct. 14 — Chicago Speedway Race.

Oct. 19—Indianapolis, Ind., Race, Indianapolis Motor Speedway.

Oct. 21 — Kalamazoo, Mich., Track Races, Kalamazoo, Motor Speedway.

Oct. 22-23—Los Angeles, Cal., Commercial Car Reliability Tour.

Nov. 16 and 18—Santa Monica, Cal., Vanderbilt Cup and Grand Prix Races.

April, 1917—Los Angeles to Salt Lake City Road Race.

### SHOWS

Sept. 25-30—Salem, Ore., State Fair, Joseph M. Rieg, manager.

Oct. 6-11—St. Louis, Mo., Open Week, Dealers' Assn.

Oct. 9—Kansas City, Mo., Fourth Annual Trade and Booster Tours, Kansas City Motor Car Dealers' Assn.

Oct. 14 - 31 — Dallas, Texas, Show, State Fair.

Jan.—First Pan-American Aeronautic Exposition. New York City; Aero Club of America, American Society of Aeronautic Engineers, Pan-American Aeronautic Federations.

Jan. 6-13, 1917—New York City, Show, Grand Central Palace, National Automobile Chamber of Commerce.

Jan. 13 - 20 — Montreal, Que., Show, Montreal Automobile Trade Assn.

Jan. 20-27—Montreal, Que., Automobile Trade Assn.

Jan. 27-Feb. 3, 1917 — Chicago, Ill, Show, Coliseum, National Automobile Chamber of Commerce.

Feb.—Newark, N. J., Show, First Regiment Armory.

Feb. 18-25—St. Louis, Mo., Show, Auto Manufacturers, and Dealers' Assn.

Feb. 3-10—Minneapolis, Minn., Show, Minneapolis Automobile Trade Assn.

Feb. 26-March 3—Omaha, Neb., Show; Auditorium, Omaha Automobile Show Assn.

March 3-10 — Boston, Mass., Show, Mechanics' Bldg., Boston Automobile Dealers' Assn.

March 6-10—Ft. Dodge, Iowa, Northern Iowa Show, New Terminal Warehouse, G. W. Tremain, Secretary.

### TRACTOR

Oct. 14-29—Dallas, Tex., Demonstration, Texas State Fair.

# The Week in the Industry

**Picard & Stern Ford Dealers**—A. J. Picard and E. Joseph Stern have opened a Ford agency at 1659 Broadway, New York City. Picard is the principal in A. J. Picard & Co., an accessory jobber and dealer and distributer of the Genemotor electric system for Fords. Stern is associated with Picard in the Picard company.

**To Handle Scripps-Booth**—Michigan distribution of the Scripps-Booth four and eight-cylinder cars has been secured by the newly-formed Oldsmobile Distributing Company, Detroit. Recently W. H. Collins and F. J. Muellerschoen bought out the Oldsmobile branch here, and the taking on of the Scripps-Booth adds another car to the line.

**Howard Denneen's N. E. Sales Mgr.**—S. B. Howard, formerly eastern and foreign representative of the General Motors Company, has been appointed New England sales manager of the Denneen Motor Company, Cleveland, Ohio.

E. P. Strang, formerly with the Kirk-Latty Mfg. Co., Cleveland, has been appointed middle western sales manager of the Denneen company.

**Fisk Rubber Builds Service Station**—The Fisk Rubber Company opened a new branch office and service station in Galesburg, Ill., leasing a new building, corner of Simmons and South Kellogg Streets. The Galesburg branch is one of a series being established throughout Illinois. The building has a frontage of 60 ft. and a depth of 80 ft. A vulcanizing department and repair shop will be inaugurated.

**Earle and Boggs Open N. Y. Office**—L. H. Earle and G. A. Boggs, who resigned from the Continental Motors Company last July, have incorporated as Earle & Boggs, to act as manufacturers' representatives for materials. Offices have been taken at 1790 Broadway, New York City, and accounts opened with the Pierce Governor Company and the Blood Brothers Machine Company.

**King from Branch to Factory**—Changes have been made at the New England branch of the B. F. Goodrich Co. at Boston by the promotion of officials to the factory. Edward King, for several years office manager, has been brought to Akron to join the administration forces. O. E. Hoeger, for some years office manager at St. Louis, has been moved to the Boston branch. C. E. Littlefield, who had charge of advertising and publicity at Boston, has been promoted to a position at Akron under E. C. Tibbetts. Mr. King was presented with a gold watch by his associates before leaving for Akron.

**Storey Takes Maxwell in Canada**—F. H. Storey, formerly an official of the Maxwell factory, at Detroit, Mich., has arrived in Winnipeg, Man., to take over the interests of the Maxwell Company of Canada, from Fort William to the Pacific Coast.

One of the first steps Mr. Storey will take will be the complete reorganization of the Maxwell service department in Winnipeg. Also there will be new showrooms of the type used by the Maxwell American firm during the New York-Chicago and Boston automobile shows last year, opened at 700 to 708 Portage Avenue.

**Cleveland Retail News**—The Jordon Motor Car Agency has been formed to handle the Jordon in Cleveland, Ohio, and space has been taken temporarily at 2052 Euclid Avenue. C. C. Neighbors, formerly of the Neighbors Motor Car Company, will be the manager, while V. E. Watkins will be sales manager. Their territory will consist of Cleveland and northeastern Ohio.

The Carris-Franklin Company, 1829 East Thirteenth Street, will handle the Franklin in Cleveland and adjacent territory. C. S. Carris has been associated with the Franklin organization for thirteen years. The employees of the service department of the agency all came from the Franklin factory.

The local sales office of the Standard Tire & Rubber Co., at Cleveland, has been moved from 5017 to 6521 Euclid Avenue. The executive offices remain in the Hippodrome Building.

J. Preston Penfield has been chosen president of the Luxurious Light Car Co., 1849 Euclid Avenue, Cleveland, to succeed J. M. Smith, who has gone to the Cole Sales Co. of Indiana.

E. D. Endsley has been appointed sales manager of the Alter Motor Car Company, distributer of Scripps-Booth and Liberty in Cleveland.

**Gets H. A. L. in Ohio**—A. W. Woodruff has organized the Woodruff Motors Co. and has opened offices and salesrooms at 2019 Euclid Avenue, having been appointed distributer of the H. A. L. for northern Ohio.

**Edison Opens in Los Angeles**—The Edison Storage Battery Supply Co. has opened its Los Angeles office on the fourth floor of the San Fernando Building, Fourth and Main Streets.

James F. Rogan, who has been acting as local distributer, will become resident manager.

**H. A. L. California Distributers**—The Eugene Schuler Co., San Francisco, Cal., has been appointed distributer for H. A. L. cars for the State.

Pearl Motor Car Co., Los Angeles, will have charge of the territory of southern California.

**Mountain Trade News**—The Colorado Motor Co., Denver, is the name of a new Reo distributing agency for Colorado, with headquarters at 1535 Cheyenne Place. The manager is George J. Hawley, formerly manager of the Reo-Saxon Auto Sales Co., Colorado Springs.

The William Thorney Auto Co., Denver, Apperson distributer for Colorado and Wyoming, has secured the Regal distributing agency for the same territory.

The Carter Motor Car Co., Denver, formerly the Overland Auto Co., which was Overland distributer for Colorado and Wyoming several years up to the recent opening of the Willys-Overland branch here, now has the King and Saxon distributing agency.

The Motor Bank, Denver, is the name of a bank just opened at 1245 Broadway, chiefly for the purpose of helping dealers finance their business when stocking up with cars.

The Roberts Auto Co., Denver, Marmon distributer for Colorado and Wyoming, is having a $20,000 building erected at 1231-1239 Broadway, on a $30,000 site. The building will be two stories high and 50 by 150 ft.

Heiser Brothers Co., Denver, Velie distributer for Colorado and Wyoming, has moved from 1236 Broadway into a new $38,000 building of its own at 700 Broadway. The new structure is 50 by 125 ft., one story and basement.

The Premier Motor Car Co. of Denver, is the name of a new $25,000 incorporation to distribute the Premier in Colorado, Wyoming and New Mexico. O. H. Woods is president and treasurer, and Charles H. Davis, formerly salesman for the Norton-Buick Co., is manager. The salesroom will be located in the Fisk Building.

The Cadillac Motor Co., Denver, Cadillac distributer for Colorado and Wyoming, is erecting a $40,000 fireproof building of steel, concrete and brick, on the corner of Broadway and East Fourteenth Avenue. It will be 50 by 133 ft., three stories and basement.